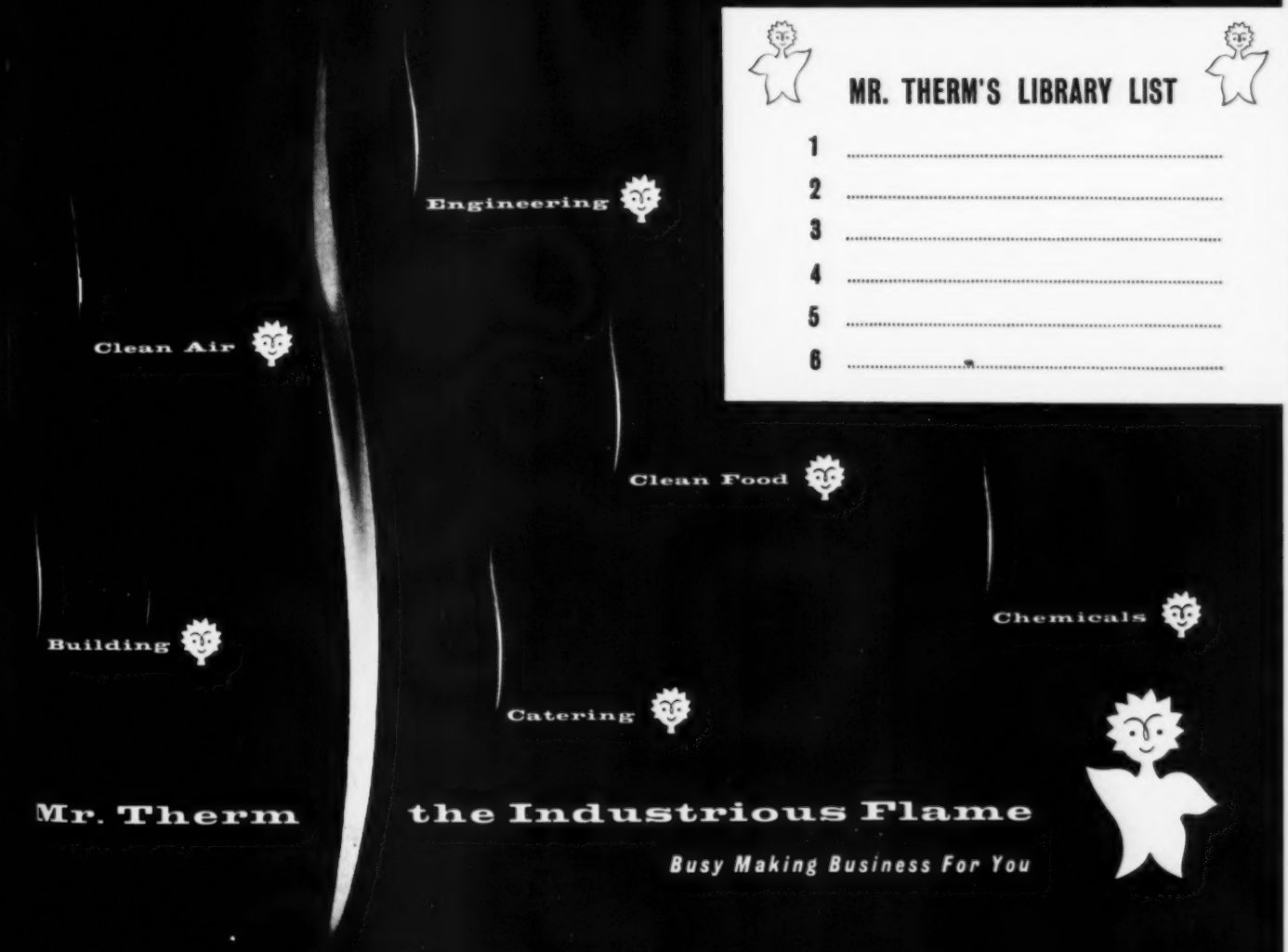
FOOD MANUFACTURE

Incorporating Food Industries Weekly

A PUBLICATION OF THE LEONARD HILL TECHNICAL GROUP DECEMBER 1, 1957

Issued by the Gas Council



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Monsanto works constantly
both to develop new,
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and to improve those
chemicals you already use . . .

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METHYL SALICYLATE

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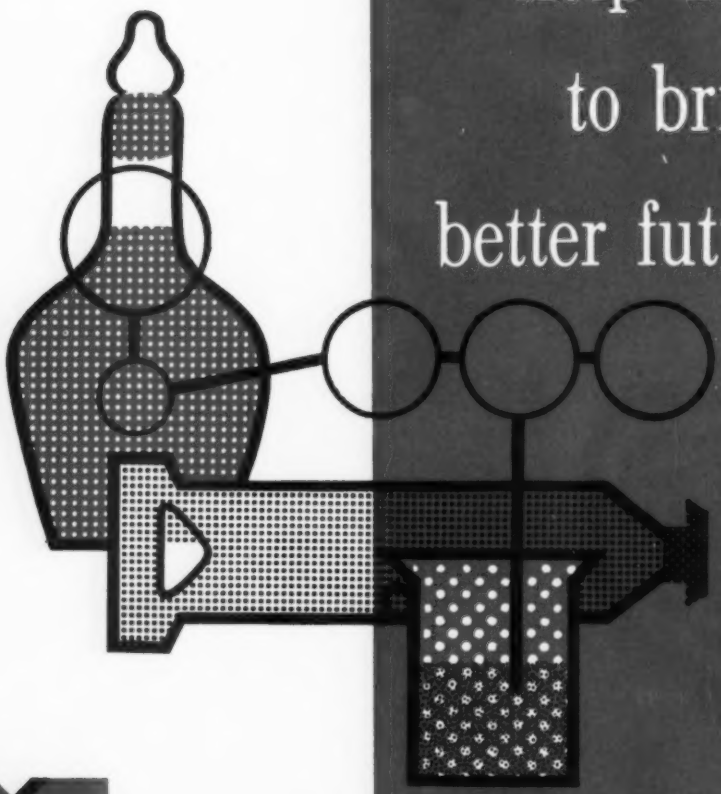

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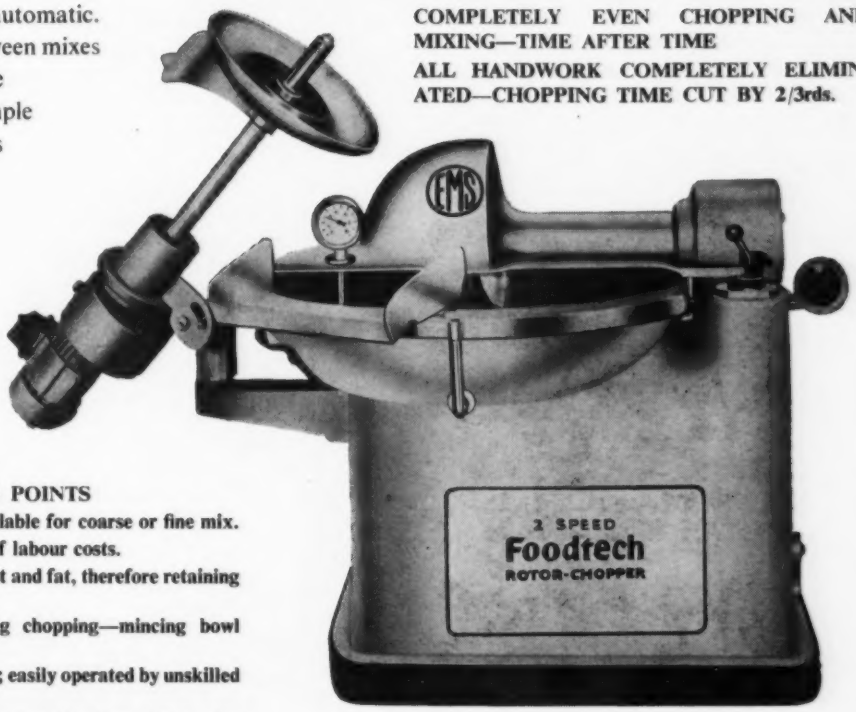
Better results *FASTER* with the FOODTECH ROTOR CHOPPER

JET COOLING SYSTEM

This Rotor-Chopper is fully automatic. That means all variations between mixes due to the human element are completely eliminated. A simple setting of the controls ensures that any two mixes will be exactly alike—even if they are made a month apart. No pre-mincing. If you wish, an automatic ejector can be fitted so that the finished mix is entirely untouched by hand.

COMPLETELY EVEN CHOPPING AND MIXING—TIME AFTER TIME

ALL HANDWORK COMPLETELY ELIMINATED—CHOPPING TIME CUT BY 2/3rds.



CHECK THESE POINTS

1. **Important. Two speeds are available for coarse or fine mix.**
2. **Guaranteed up to 50% saving of labour costs.**
3. **Guaranteed no squeezing of meat and fat, therefore retaining bloom and colour.**
4. **No rise in temperature during chopping—mincing bowl insulated.**
5. **No pre-mincing or hand working; easily operated by unskilled labour.**
6. **This machine breaks down frozen meat blocks up to 24″ x 12″ in 25 seconds.**

FOODTECH BULLETIN

90% of all complaints are discoloration and shrinkage of sausages. I assure you that with this Rotor-Chopper plus our MSB these troubles will disappear. Colour, texture and keeping qualities of the sausage will be guaranteed.

PRICES

Serial No.	Meat Capacity	Delivered Price
		£
MK 30	30/40 lb	366
MK 40	40/50 lb	452
MK 60	60/80 lb	581
MK 80	80/100 lb	657
MK 100	100/120 lb	805
MK 160	160/200 lb	1440
MK 200	200/250 lb	1595

PLEASE WRITE FOR DETAILS

Foodtech Ltd.

Queen Anne's Place, Bush Hill Park, Enfield, Middlesex

Telephone: LABurnum 6656/7

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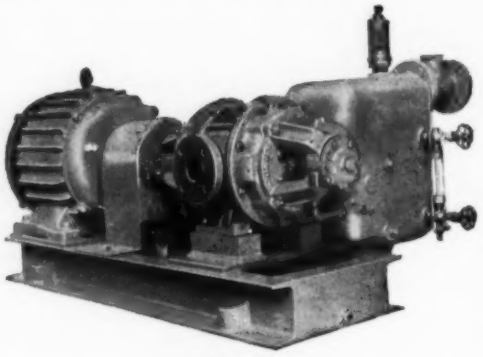

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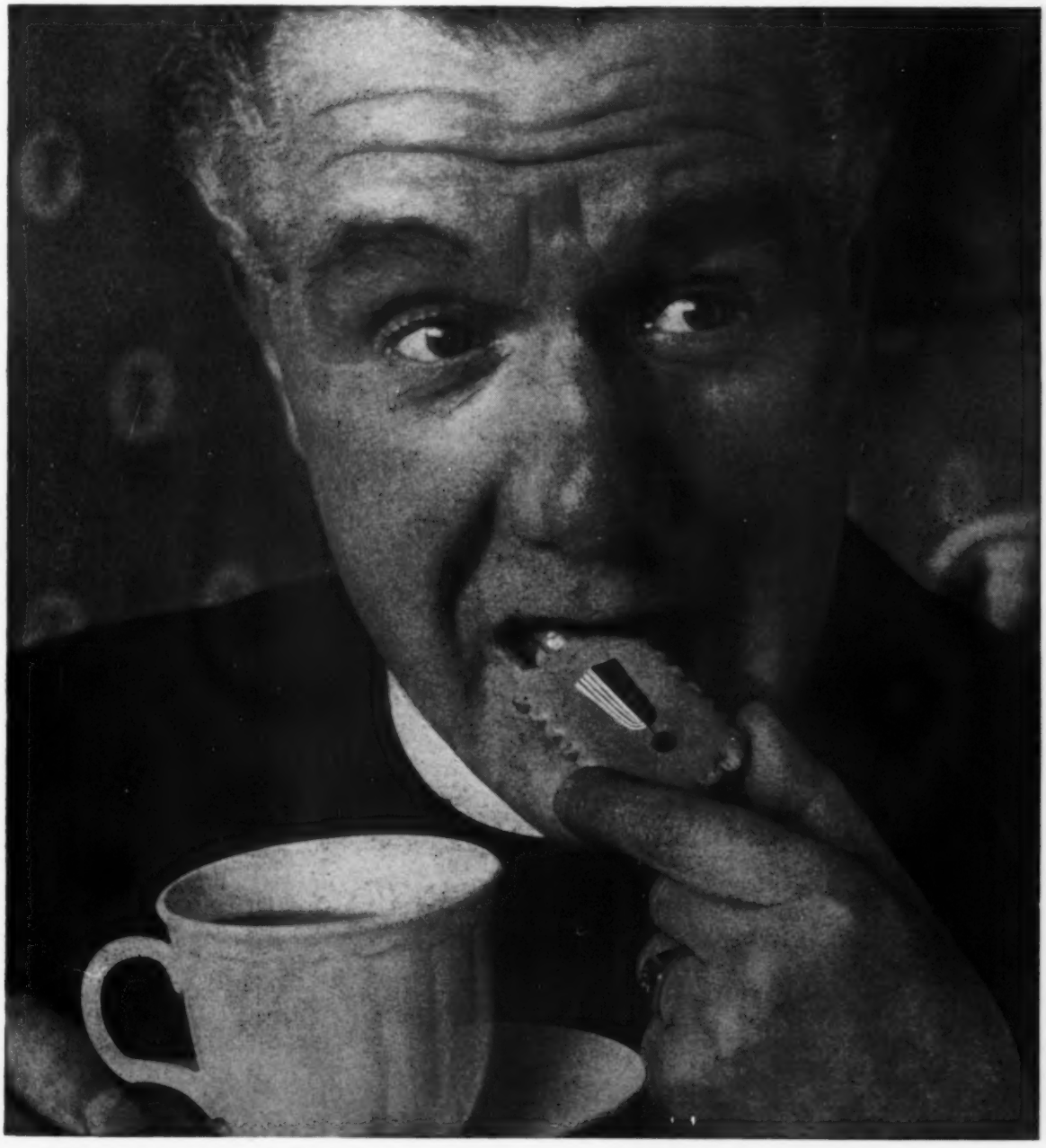

Cockade Reg'd. **the very cream of milk powders!**

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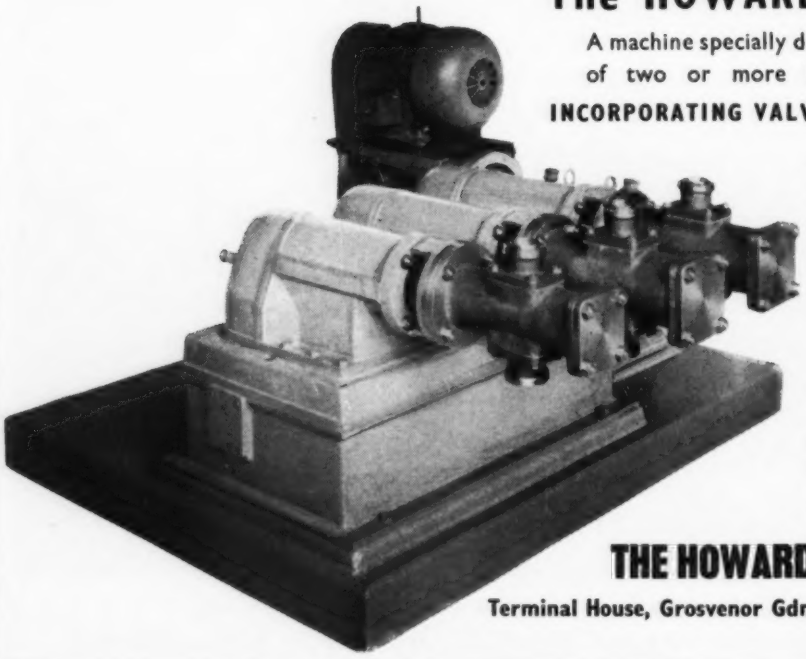
Continuous Liquid Blending..

The HOWARD LIQUID BLENDER

A machine specially developed for the continuous blending of two or more liquids in any given proportions.

INCORPORATING VALVLESS, PISTON METERING PUMPS



SPECIAL FEATURES:—

Ability to handle all liquids, light, heavy, viscous, semi-solids and slurries.

Great accuracy which is unaffected by small particles of foreign matter in the liquid being handled.

ABSOLUTE RELIABILITY

◀ *3 unit Blender having a capacity of 1,250 gallons per hour made in 18/8/3 Stainless steel for blending fruit juices and sugar syrup.*

Machines can be supplied with any number of units up to 8. The capacity of any one unit from a few gallons per hour up to a maximum of 1,500 gallons per hour.

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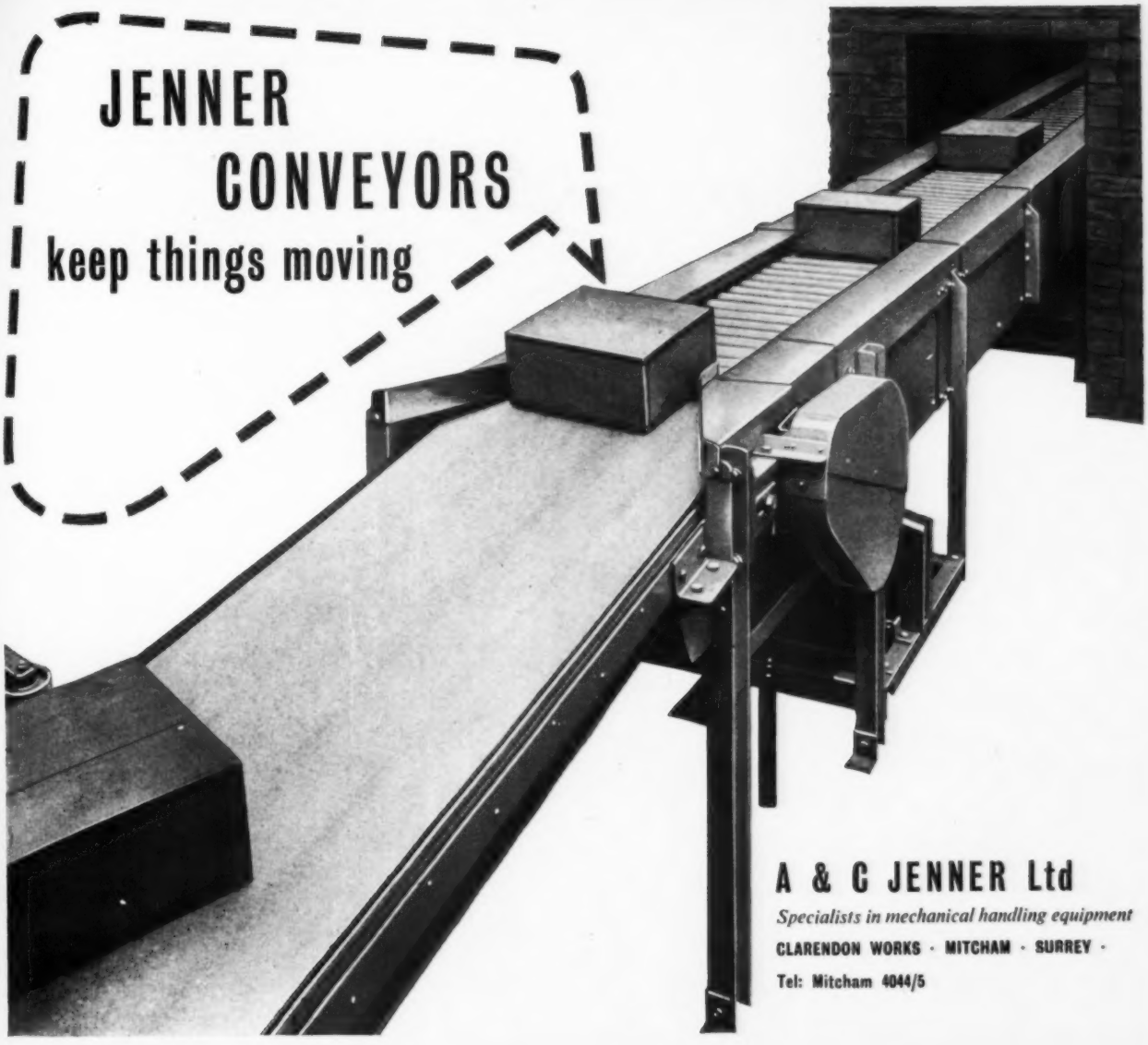
keep things moving



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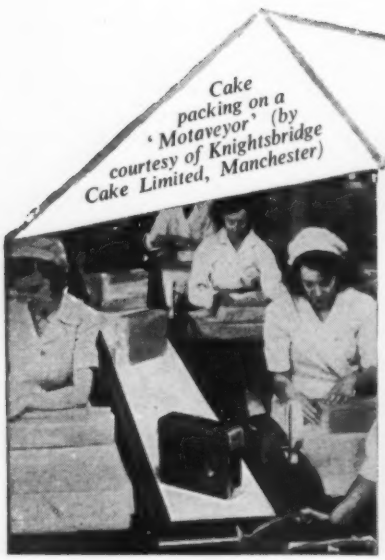
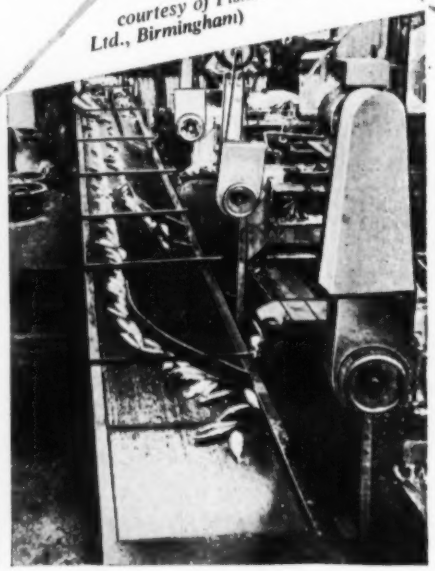


Cake packing on a 'Motaveyor' (by courtesy of Knightsbridge Cake Limited, Manchester)

Fruit bottling on a 'Motaveyor' conveyor (by courtesy of J. Mawdsley Ltd., Wigan)



Scandura conveyor in a fish canning factory (by courtesy of Fisher & Ludlow Ltd., Birmingham)

As the pioneers of P.V.C. covered conveyor belting British Belting & Asbestos have supplied their SCANDURA belting for many varied applications. Due to its resistance to contamination and its hygienic qualities SCANDURA has become the obvious choice for food conveyor belting. Its lasting qualities had already been proved in food factories two years before its first introduction in Britain's coal mines in 1948, and its fire resistant properties have brought a hitherto unknown safety margin where conveyor fire hazards originally existed. SCANDURA is available now, in varying widths and thicknesses to suit all applications.

SCANDURA P.V.C. BELTING IS MANUFACTURED BY **BBA**

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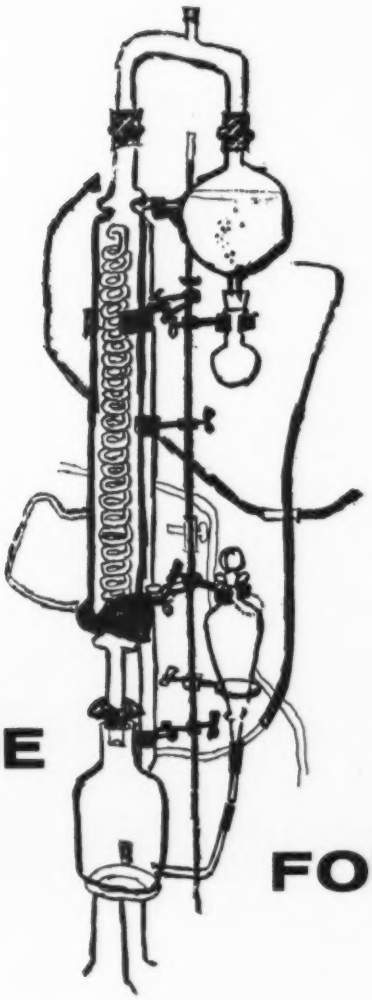

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A

Synthetic Vitamin A concentrates & powders
Synthetic beta-carotene

B

Aneurine Hydrochloride & Monitrate
Riboflavin & Riboflavin 5-Phosphate
Nicotinic Acid & Amide
Calcium-d-pantothenate
Pyridoxine Hydrochloride

C

Ascorbic Acid & Sodium Ascorbate

E

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Roche are specialists in the large scale manufacture of pure synthetic vitamins
A comprehensive technical service backed by the international resources of the Roche organisation is available

SCANDINAVIAN woods and water

Scandinavia has plenty of both, which explains why so much commercial interest centres on these two natural assets. Timber is felled, logged and floated down river, pulped in water-powered mills and processed into a fine white folding box board known as 'SCANDINAVIAN', so pure is it that the most sensitive products can be packed in it without risk of taint or odour. 'SCANDINAVIAN' takes printing admirably and generally eliminates protective lining paper.

SCANDINAVIAN

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**SCANDINAVIAN PACKING FOR SENSITIVE PRODUCTS*
The name SCANDINAVIAN guarantees a pure folding box board produced by the associated box board manufacturers of Finland, Norway and Sweden.

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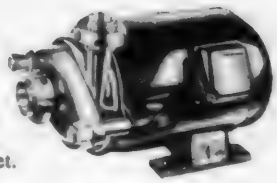
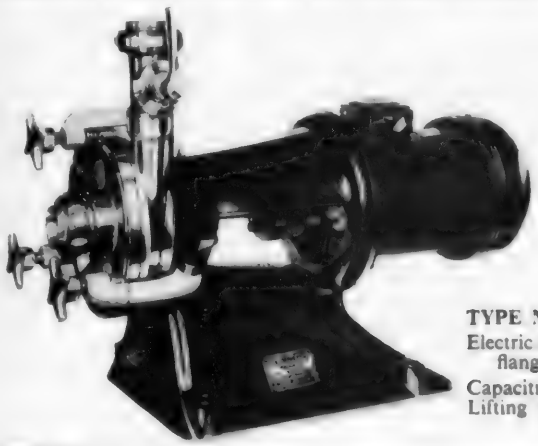
Think of DE LAVAL first!

STAINLESS STEEL CENTRIFUGAL PUMPS

All De Laval Stainless Steel Centrifugal Pumps are of easy clean design—even the impellers are in two halves—a special De Laval feature. Fitted with mechanical seals they are ideal for pumping duties in the food and process industries.

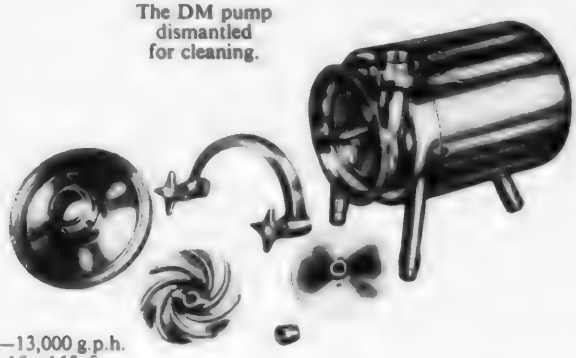
TYPE CM1
All stainless contact
Capacities 1,100—3,300 g.p.h. Lifting head 15-20 feet.





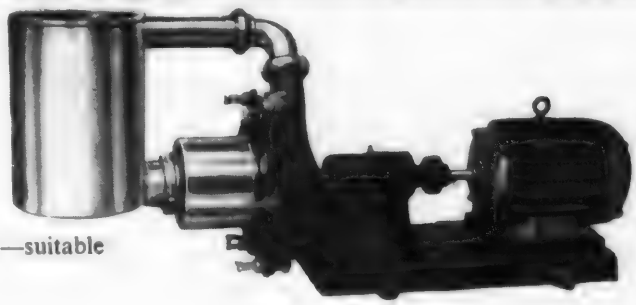
TYPE MZ-155
Electric drive with flange motor
Capacities from 220—13,000 g.p.h.
Lifting heads from 15—165 feet.

The DM pump dismantled for cleaning.



NEW DE LAVAL Defoaming Pump DZ3R

A DUAL DUTY PUMP FOR AERATED LIQUIDS
—SEPARATES AIR
—PUMPS DEAERATED LIQUID



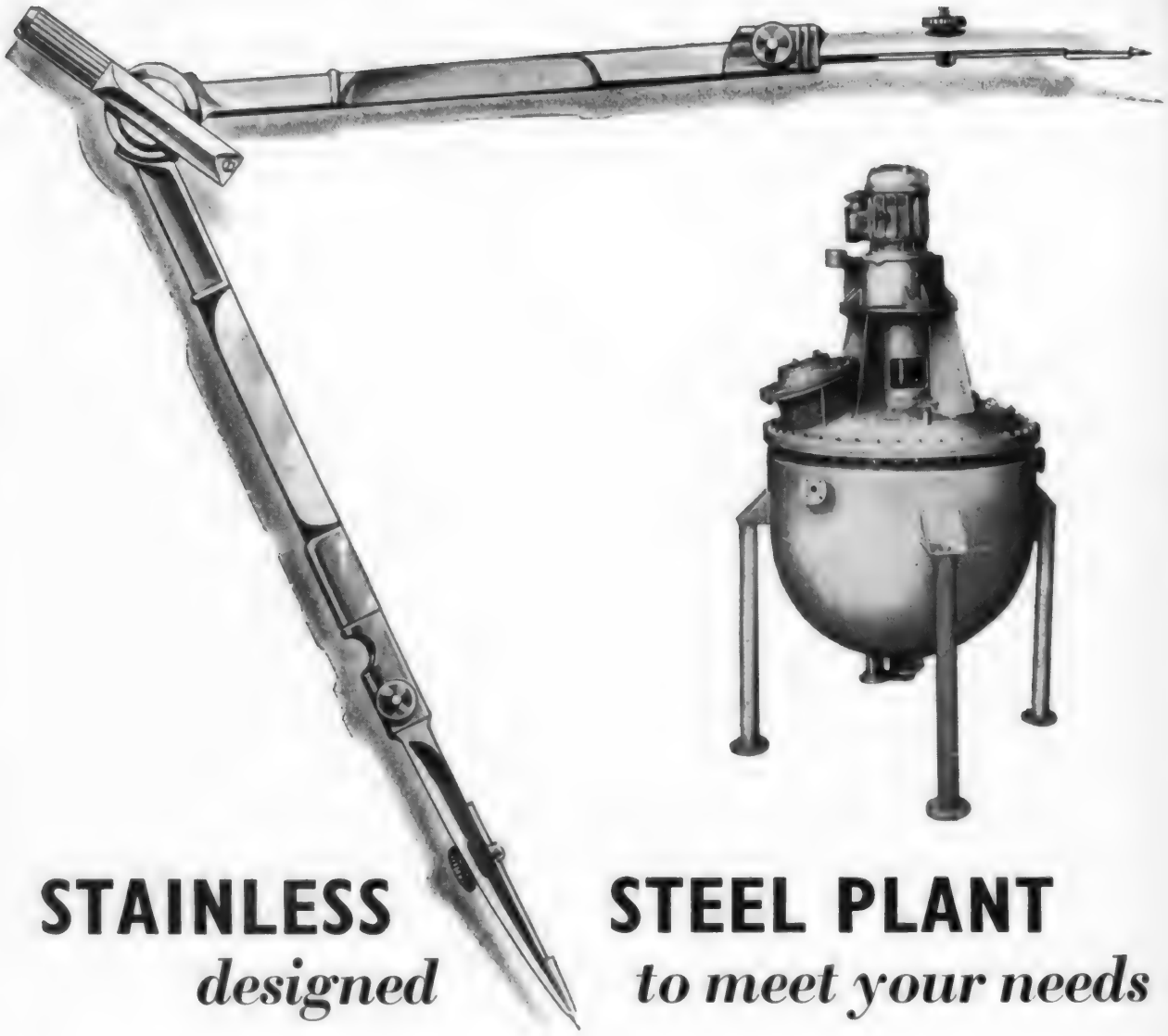
Easily cleaned—all stainless steel construction—suitable for capacities up to 6,500 g.p.h.

Write for full details of the whole range of De Laval stainless steel pumps

DEPENDABLE DE LAVAL CENTRIFUGAL SPECIALISTS FOR OVER 75 YEARS

Think first of **DE LAVAL** Centrifugal Separators for your separation problem and **DE LAVAL** Heat Exchangers for all heat transfer problems.

PROCESS ENGINEERING DIVISION: ALFA-LAVAL CO. LTD., GREAT WEST ROAD, BRENTFORD, MIDDX. PHONE EALING 0116



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Stainless Steel Vessels will meticulously follow your specification. We have technical representatives who are available to discuss your design and fabrication problems, without obligation. May we send you illustrations of plant which we have made and supplied —mostly 'to order'—to widely differing industries?

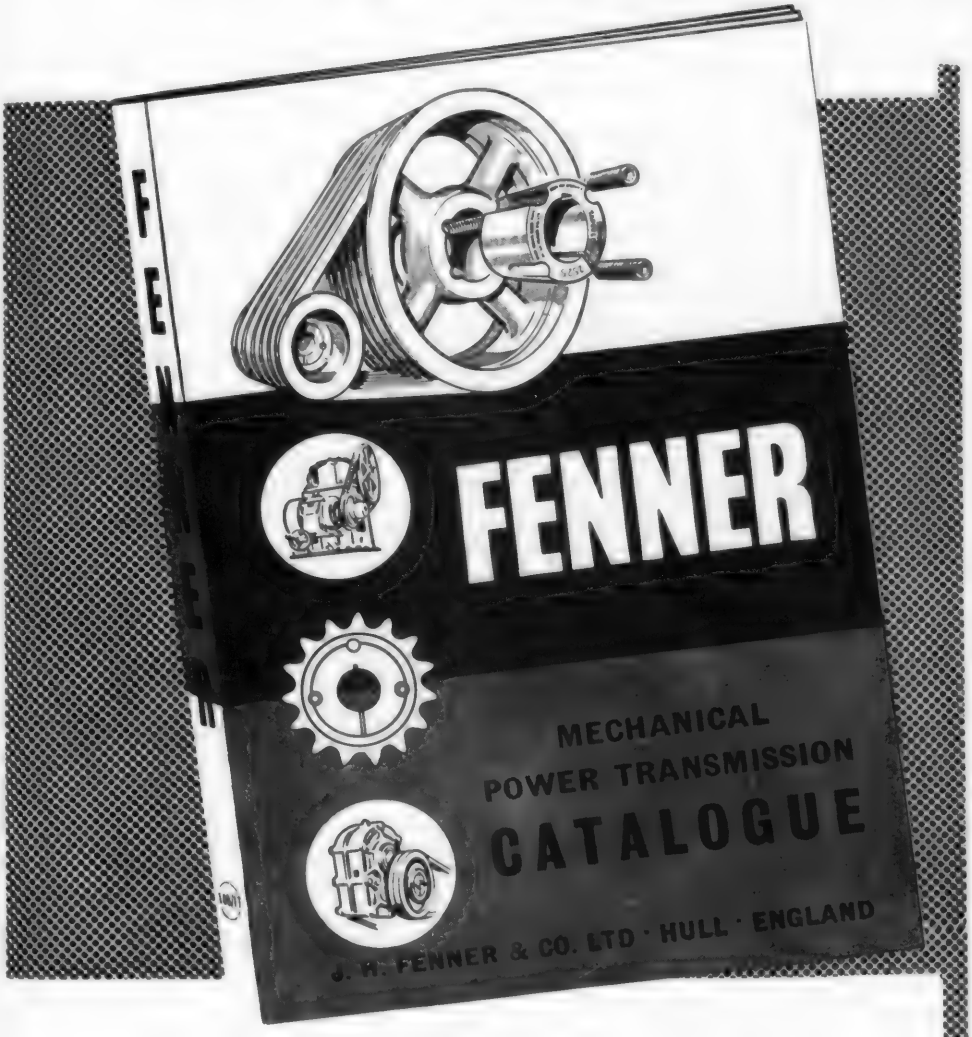
Stainless Steel Jacketed Agitated Reaction Vessel

Plastics have undoubtedly come to stay in the Food industry and, among Plastics, polymers predominate. This Jacketed Agitated Reaction Vessel formed an important part of a Polymer Plant supplied to Messrs. Keiner and Company Ltd., of Mitcham.

STAINLESS STEEL VESSELS (LONDON) LIMITED

MANORGATE ROAD, KINGSTON-ON-THAMES, SURREY. Telephone: Kingston 5625 (5 lines) Telegrams and Cables: Essevessel, Kingston-on-Thames

Designing a Drive?



V-BELT DRIVES

V-BELTS

TAPER-LOCK PULLEYS

TAPER-LOCK CHAIN DRIVES

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Britain's first pocket size drive handbook, with copious information, convenient to handle and easy to read. Sales 'patter' has been rigorously excluded—this is a working tool for designers and draughtsmen who have already decided to buy Fenner products. It contains just the information the user requires as determined in 25 years experience by the engineering staff of

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LARGEST MAKERS OF V-BELT DRIVES IN THE COMMONWEALTH

Two heads are better than one . . . so send that flavouring problem to the

BOEHM EXPERIMENTAL KITCHEN

As acknowledged experts in the field of food flavouring it is possible that we have the answer to your immediate flavouring problem. If not, the Boehm Experimental Kitchen will get to grips with it and do its best to find a solution. This service is absolutely free and, needless to add, is becoming more and more popular with manufacturers. Incidentally, many products today owe a great deal to the shrewd advice and technical help of Fredk. Boehm Ltd. Why not put your problem in the post to them NOW?

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Mono-sodium glutamate 99% pure.

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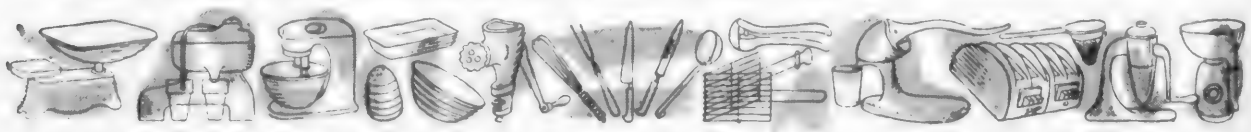

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The Complete Packaging System

HYPAK Polythene Bags teamed with the now famous HYPAK Polysealer meet the demand for the speedier and more economical handling of Food, Fruit and Vegetables in large or small self-service stores and family grocers alike.

HYPAK Bags present the product to the housewife in the way she prefers, hygienically, fresh, attractively—and if specially printed with your own Brand name they are your silent but forceful salesmen, reaching into the home of every customer.

The HYPAK Polysealer

—a revolutionary machine for sealing all standard gauges of **Polythene (Polyethylene). Pliofilm,** and **Heat Sealing Cellulose Films**—gives you these 5 starred advantages.

- ★ Only one sealing action—no skill needed—instant release after seal giving greater speed.
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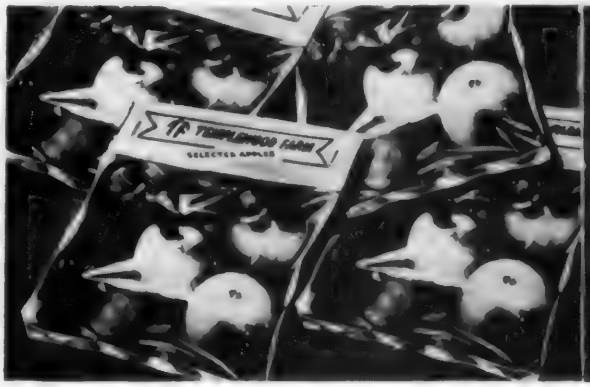
- ★ Compact and portable—Size 17″ X 9¾″ X 8¼″

Price 19 Gns.



The HYPAK DIVISION of the OPPENHEIMER CASING CO. (U.K.) LTD. **159-165 HARROW RD., LONDON, W.2.**

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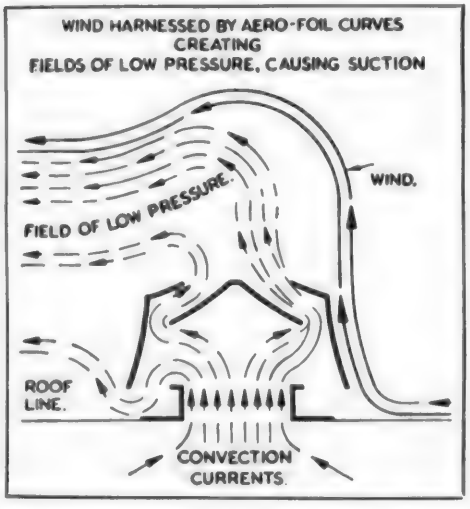
The S.P.D. Ltd., Depot at Chelmsford, Essex.
Consulting Engineers: Frederick S. Snow and Partners.
Colt Equipment: 80 S.R.2060 Natural Extractors.

In S.P.D. depots throughout Great Britain, the complex ventilation requirements of these warehouses are being met by Colt Natural Ventilation systems.

The installation of Colt S.R.2060 Ventilators, shown above at the Chelmsford depot, is the Colt solution to an intricate problem concerning the relationship between ventilation and structural insulation ; both of them essential to the products stored.

Every problem Colt tackle receives the same meticulous attention. Colt have practical experience in installing ventilation systems for over 10,500 firms, throughout the world. A Technical and Advisory Staff are ready to adapt this knowledge to your particular requirements.

Let COLT solve YOUR problem.



COLT

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VENTILATION

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Branches at : Birmingham, Bradford, Bridgend (Glam.), Bristol, Dublin, Glasgow Leamington Spa, Liverpool, London, Manchester, Newcastle-upon-Tyne, and Sheffield. • Agents in : Australia, Belgian Congo, Belgium, Burma, Canada, Cyprus, India, Indonesia, Madagascar, Malaya, Mauritius, New Zealand, Pakistan, Portugal, Rhodesia and Nyasaland, South Africa, and West Indies.

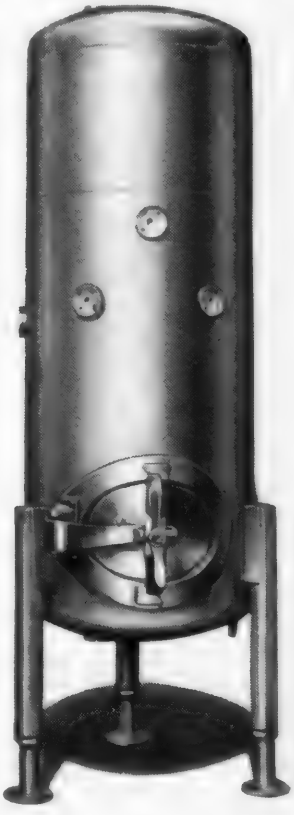
G.586

Butterfield craftsmen are called upon to turn out a wide variety of Stainless Steel, Mild Steel, Nickel and Monel plant, Tanks, Vats, Vessels and so forth, to Plant Engineers' specifications for the storing, processing and refining of liquids for the Food Industry. This is important work for important jobs and Butterfield expert craftsmanship and attention to detail can be relied upon to produce extremely good results.

Butterfield

Storage Tanks

in Stainless Steel, Nickel & Monel



We are equipped with Weld X-Ray Plant, materials testing and microscopic examination facilities for any required class of work

ILLUSTRATIONS
(top) Stainless Steel Sugar Solution Storage Tanks (right) A 5-barrel Stainless Steel Beer Storage Tank

Please mark all enquires relating to this advertisement as follows: F, M/12

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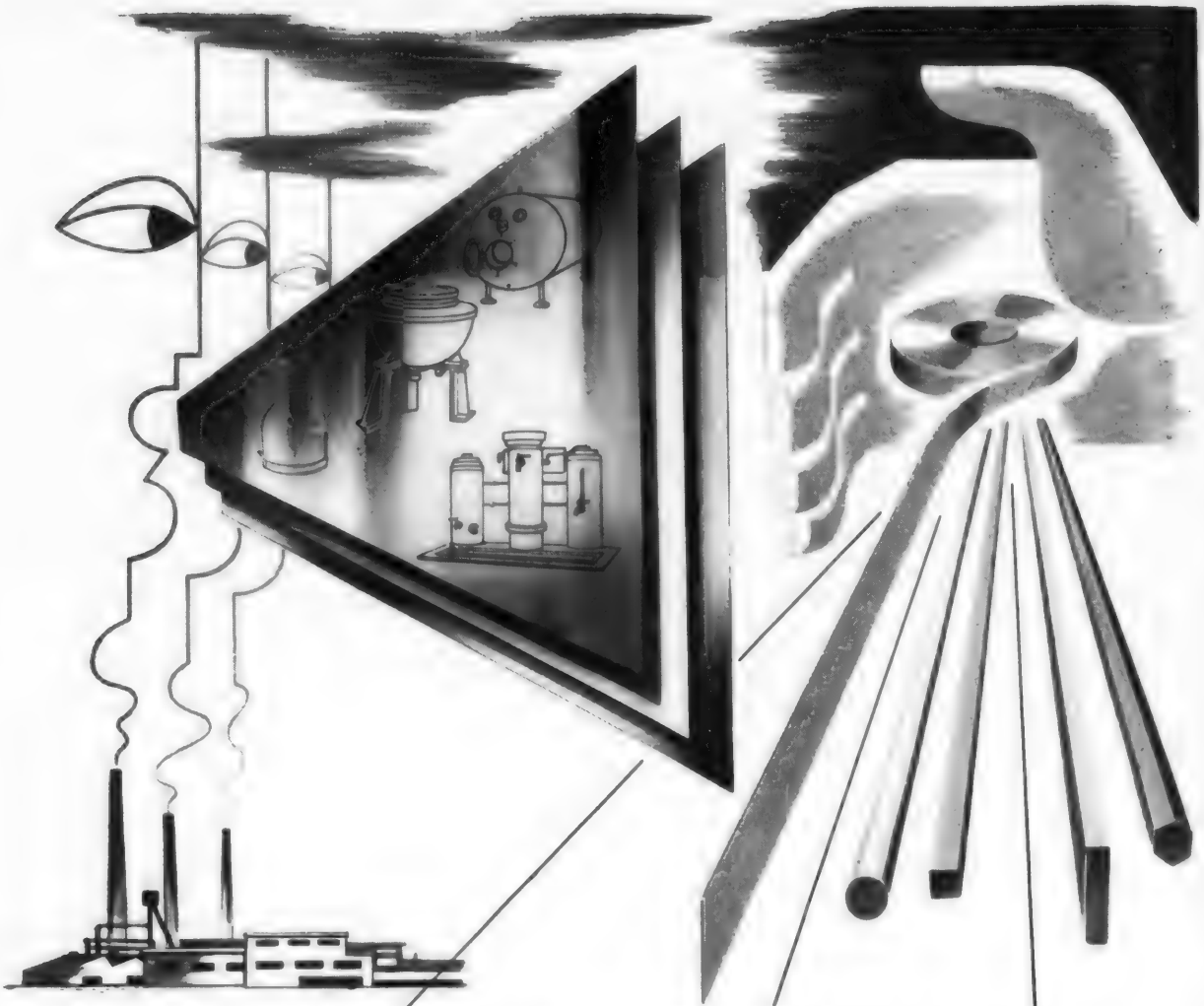

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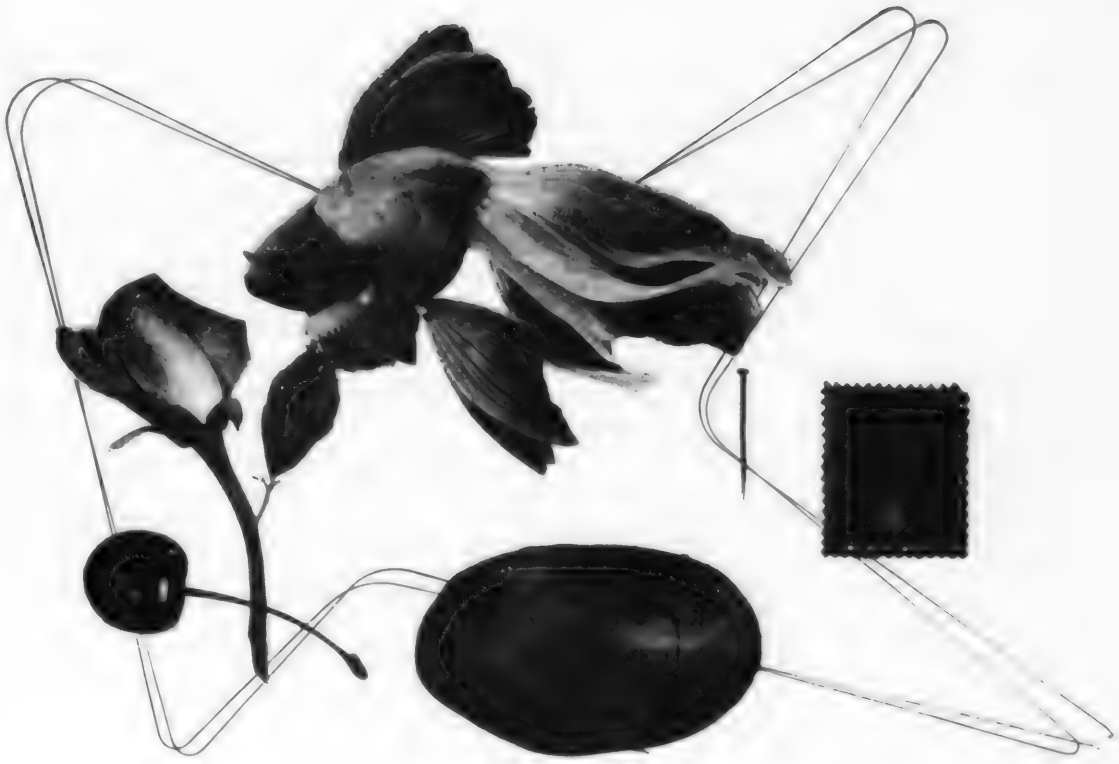

THIS, THAT AND THE OTHER . . .

. . . transparent packaging films play a unique role in protecting and "moving" merchandise of every description. The variety is almost infinite.

So, too, is the variety of films. As the largest manufacturers of cellulose film in Europe and the Commonwealth and makers of the famous "Cellophane" film, as makers of B.C.L. polythene film and sole agents for Courtaulds' cellulose acetate film, we are proud of our ability to supply films in types and gauges to suit every product.

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Colodense Ltd., an associated company, has an international reputation as high-quality colour-printers and converters of transparent films.

In addition, we offer an incomparable service—help with technical, machine and package-design problems.

Whatever your product, we have the best film for it. Whatever your packaging problem, we shall be delighted to help you, without obligation. Why not get in touch with us today?

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"Cellophane" is the registered trade mark of British Cellophane Limited and denotes the brand of cellulose film manufactured by them.

A MEMBER OF THE LARGEST DAIRY ORGANISATION

WILTS UNITED DAIRIES

No. 1 HEMYOCK

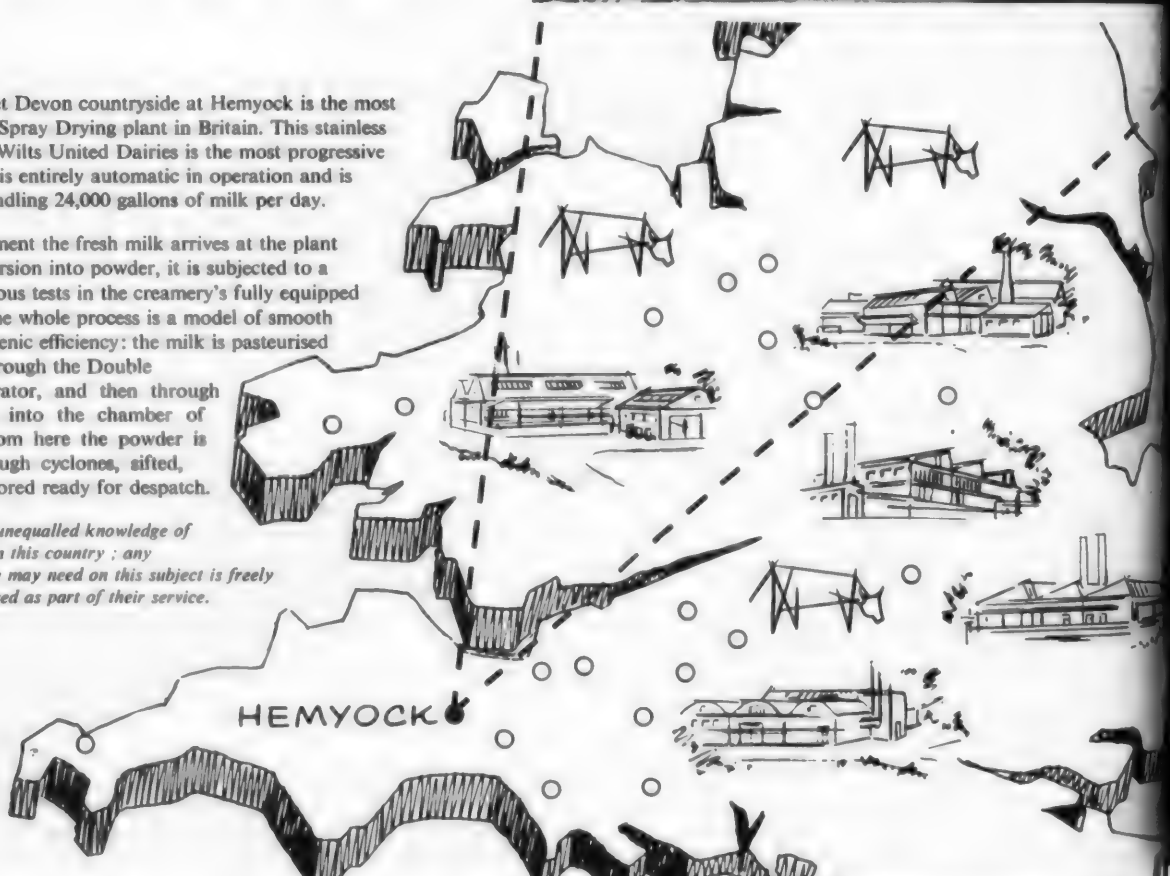
An exterior view of the Hemyock plant in its delightful rural setting.

MILK PROCESSING THE MODERN WAY

Amid the quiet Devon countryside at Hemyock is the most modern Milk Spray Drying plant in Britain. This stainless steel plant of Wilts United Dairies is the most progressive of its kind. It is entirely automatic in operation and is capable of handling 24,000 gallons of milk per day.

From the moment the fresh milk arrives at the plant until its conversion into powder, it is subjected to a series of rigorous tests in the creamery's fully equipped laboratory. The whole process is a model of smooth and ultra-hygienic efficiency: the milk is pasteurised and passed through the Double Effect Evaporator, and then through the Atomiser into the chamber of the dryer. From here the powder is collected through cyclones, sifted, packed and stored ready for despatch.

WILTS *have an unequalled knowledge of milk products in this country ; any information you may need on this subject is freely and gladly offered as part of their service.*



This map shows the position of the Hemyock Plant and also the many other Wilts United Dairies Creameries and Factories all over the country.

FOR QUALITY AND SERVICE

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UNITED DAIRIES

IN THE COMMONWEALTH

for all forms of milk

PRODUCED AT HEMYOCK:
Spray Full Cream Milk Powder, Spray Skim Powder, "Kreemix" Complete Ice Cream Powder

PRODUCED AT THE OTHER WILTS CREAMERIES:
Full cream and skim roller processed powders. Full cream and skimmed sweetened condensed milk. Unsweetened full cream evaporated milk. Full cream and skimmed milk powder.

And, of course, Butter, Cheese, Cream and all other Dairy Products

WILTS
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Trowbridge • Wiltshire

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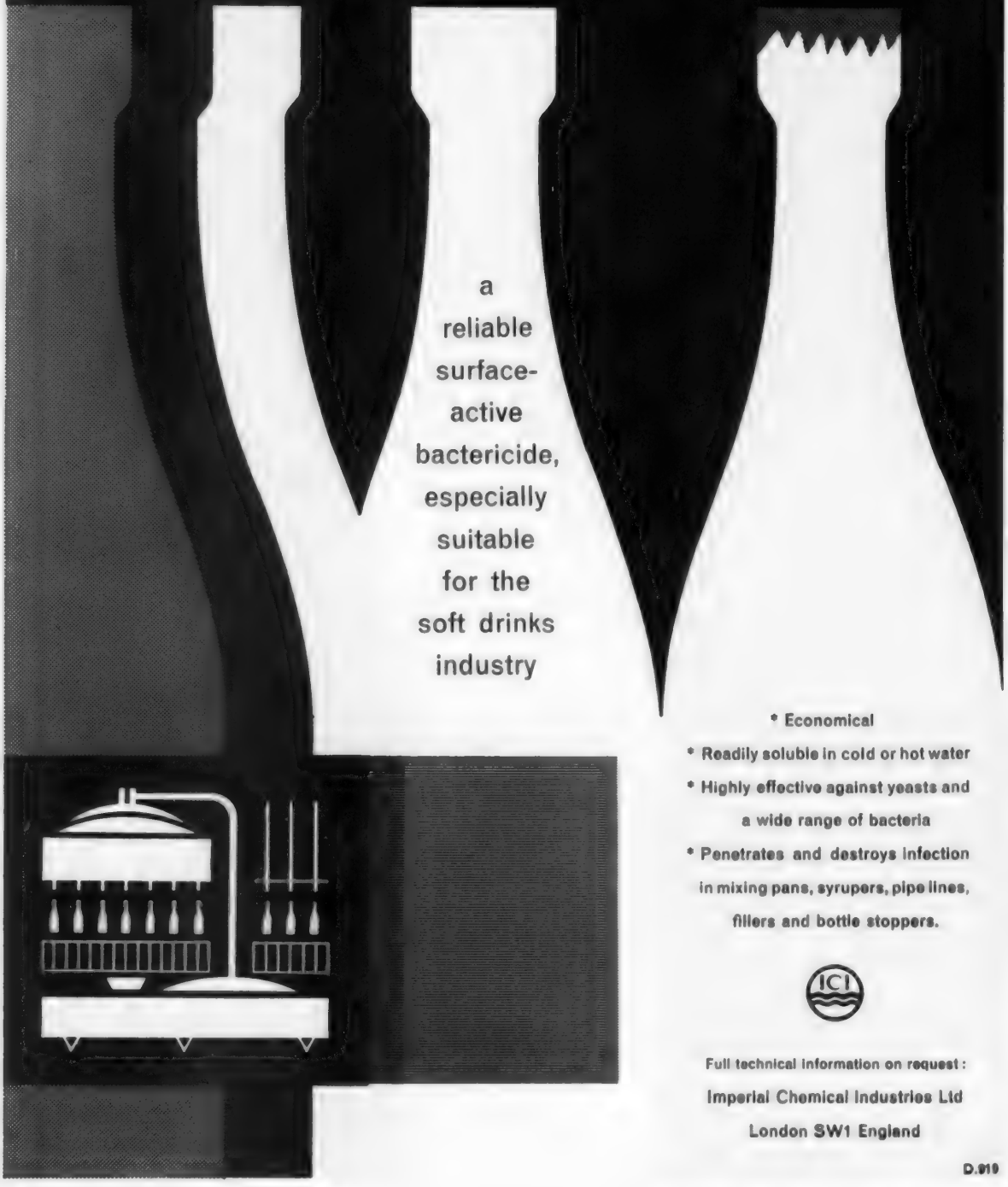
View of the cyclones and Double Effect Evaporator incorporated in the new fully automatic Milk Spray Drying Plant at the Wilts United Dairies Creamery at Hemyock in Devon

Vantoc AL



a reliable surface-active bactericide, especially suitable for the soft drinks industry

* Economical
* Readily soluble in cold or hot water
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* Penetrates and destroys infection in mixing pans, syrupers, pipe lines, fillers and bottle stoppers.

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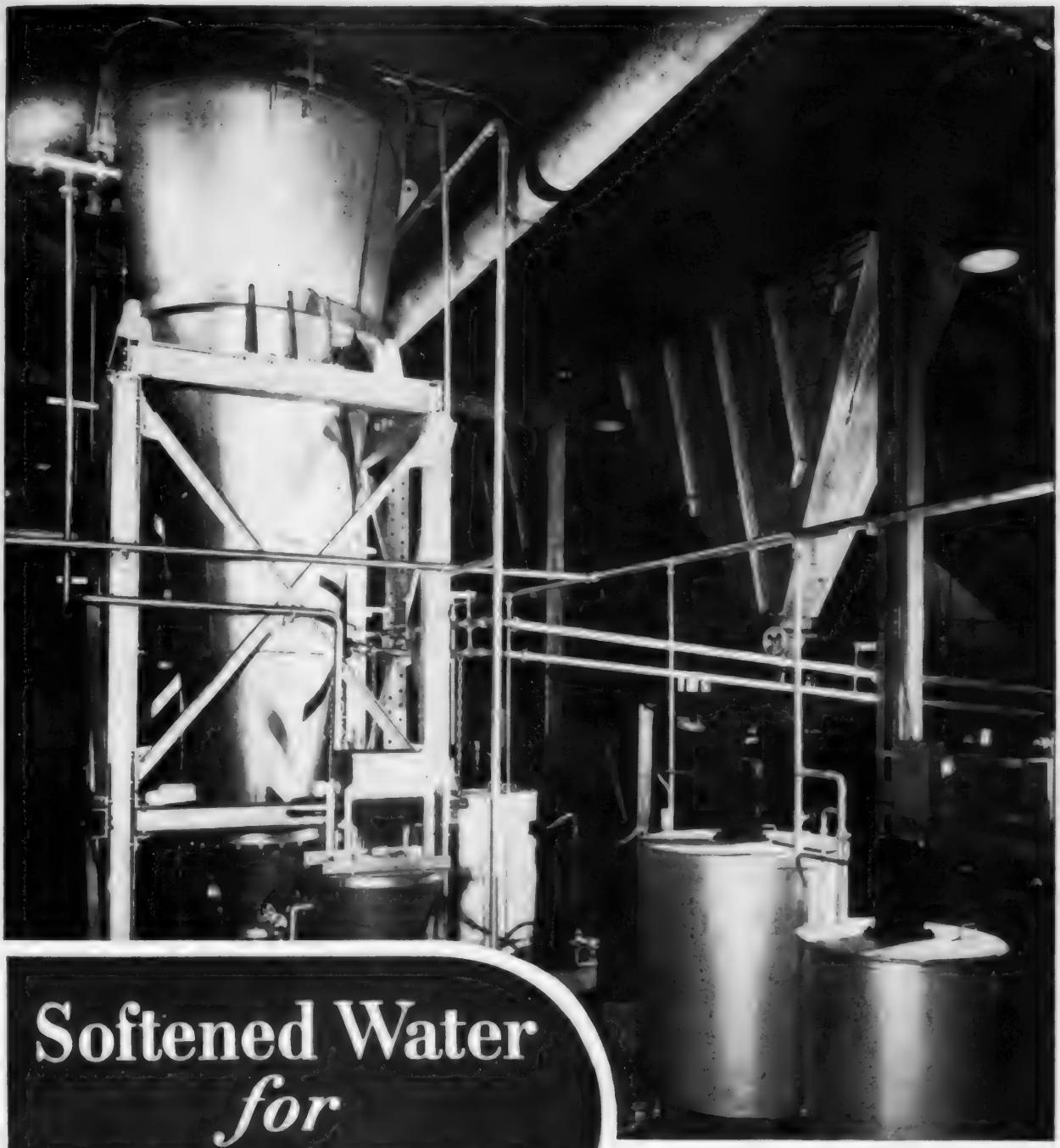

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Consistent zero-hard softened water for boiler feed is supplied by "Spiractor" cold lime softener followed by a Permutit Ion Exchange softener. This is only one of a range of Permutit plant designed to supply correctly treated boiler feed. If you require further information on Permutit boiler feed water treatment plant, please write to :—

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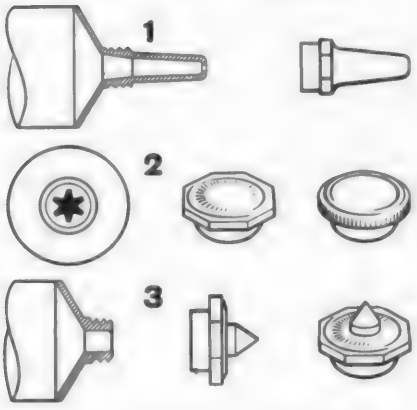
WITH **'DALE'** FEATURES



special nozzles

Customer and consumer demand is catered for in every way. John Dale Limited offer as standard a variety of special nozzles without tool charge for special purposes. Examples are:—

1 The elongated nozzle for piping with icing or jellies.

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3 The thin membrane sealed nozzle. This Dale development offers you an Aluminium tube which with its sealed 'Easy-pierce' nozzle is ideally suited to products which must be kept airtight. This nozzle on a tube with one of Dale's special endseals is the perfect pack for any product which is inclined to seep. The nozzle is, of course, easily pierced by means of the spiked cap as illustrated above.

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lights the way

—to increased production. Good lighting is an essential tool in any industry—the planning of it a job for experts. Today industrialists rely on the experience and advice of Benjamin as they have done for the last half century.

Consult Benjamin and let them put your workers on a full-time basis.

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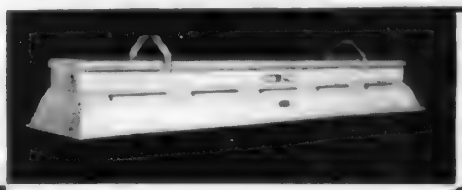

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Used single or in continuous runs they have proved their worth in factories throughout the world. This is just one of the vast range of reflectors specially designed for a specific application by Benjamin.

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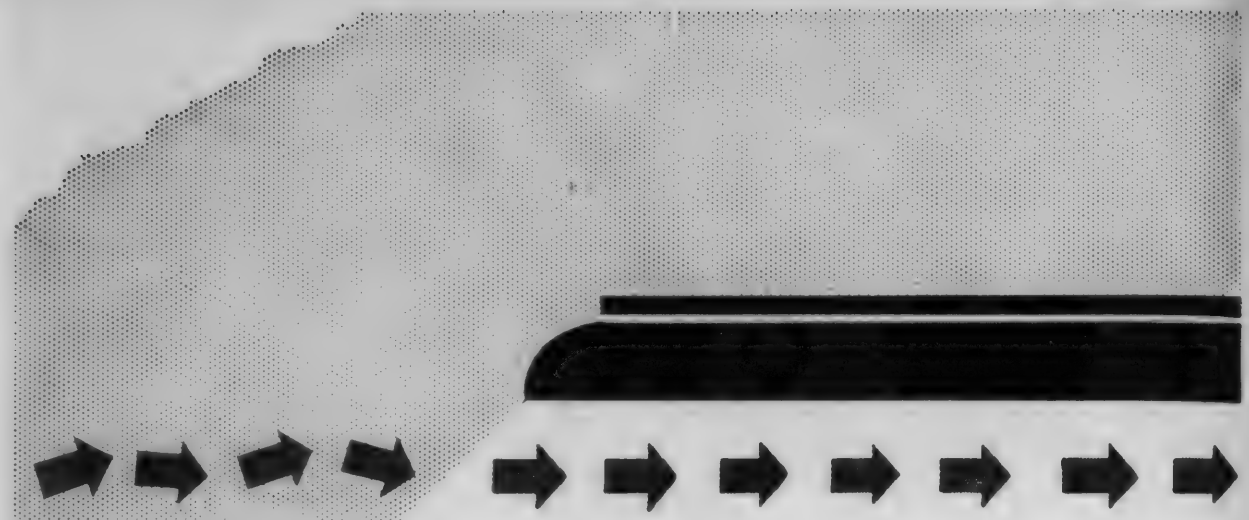


Better Lighting—
Better Production

What is the lighting in your factory like? Have you recently checked the lighting level round the works with a light meter?

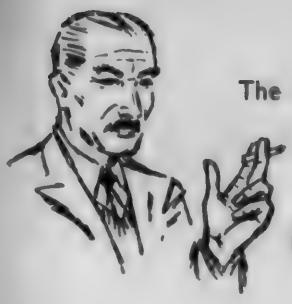
The *right* lighting has a significant effect on the speed and accuracy of production. When its strength, position and type is suitable for each job the craftsman can give full play to his skill, and the works engineer can do full justice to his shop.

Good lighting is only one of the many ways in which electricity is playing a vital part in the drive for higher productivity.

Electricity for Productivity

Ask your ELECTRICITY BOARD for advice and information, or get in touch with E.D.A. They can lend you, without charge, films about the uses of electricity in industry. E.D.A. are also publishing a series of books on Electricity and Productivity. Titles now available are: Lighting in Industry, Electric Resistance Heating, Electric Motors and Controls, Higher Production, Materials Handling, and the latest addition to the series, Induction and Dielectric Heating. Price 8/6, or 9/- post free.

Issued by the
British Electrical Development Association
2 Savoy Hill, London, W.C.2



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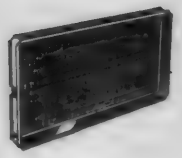
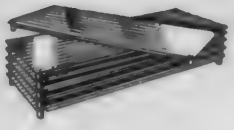




STACKING TRAY (Catalogue No. TB.27153)

As illustrated above, having dimensions of 26¾″ × 14¾″ × 2¼″ made as pressings from 16g Light Alloy with special corner stacking features which have convex locating dimples for greater efficiency and giving ¾″ air space when stacked. Alternative brackets giving greater or less air space can be fitted if required.

Also available with a depth of 1¾″ (TB.27151) and both depths can have perforated bases.

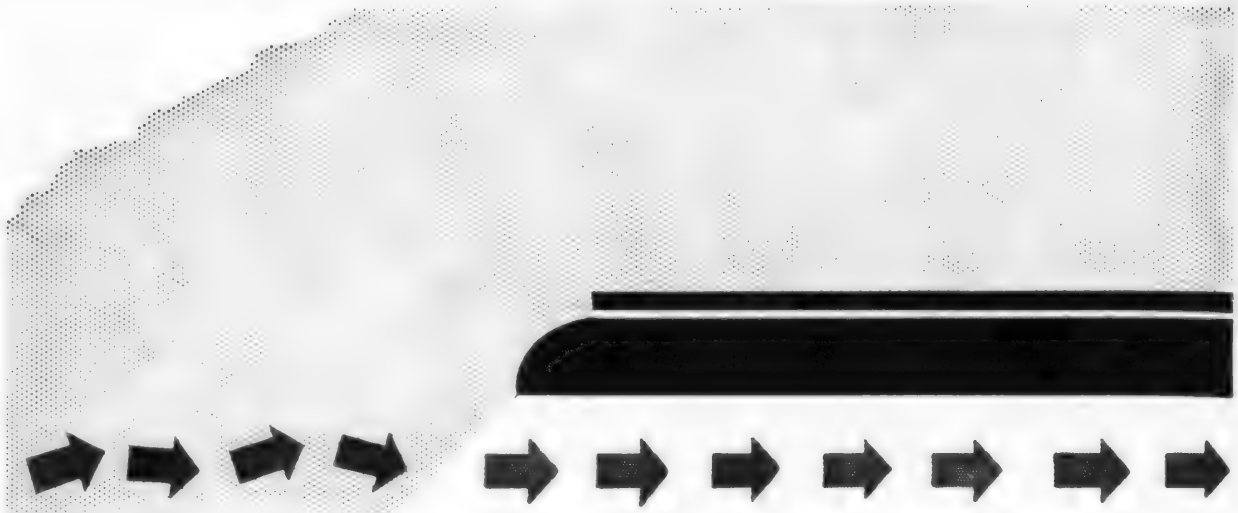
WARWICK
'WARCO'
Reg Trade Mark
ENGLAND

First Choice for Aluminium Equipment

WARWICK PRODUCTION COMPANY LTD

A MEMBER OF THE **ALMIN GROUP**

BIRMINGHAM ROAD, WARWICK TELEPHONE: WARWICK 693-696



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Better Production

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Good lighting is only one of the many ways in which electricity is playing a vital part in the drive for higher productivity.

Electricity for Productivity

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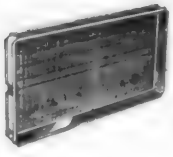
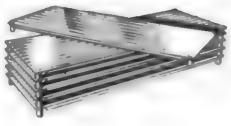
'RACKS are out of date–we use WARCO STACKING TRAYS'





STACKING TRAY (Catalogue No. TB.27153)

As illustrated above, having dimensions of $26\frac{3}{4}'' \times 14\frac{3}{4}'' \times 2\frac{1}{4}''$ made as pressings from 16g Light Alloy with special corner stacking features which have convex locating dimples for greater efficiency and giving $\frac{3}{4}''$ air space when stacked. Alternative brackets giving greater or less air space can be fitted if required.

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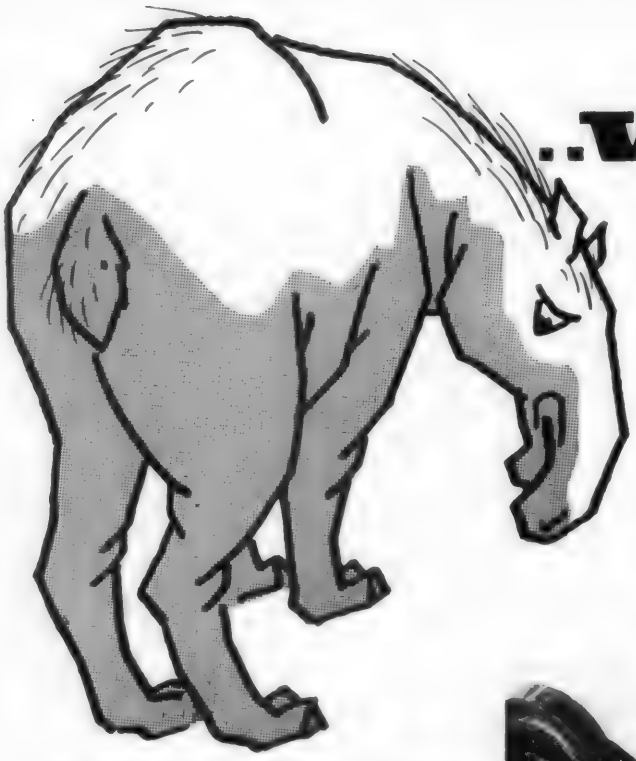

...wrap up!

(says Timothy Tapir)

Wrap up! says Timothy Tapir
Level at me no mockery
Subject not my proboscis to jest.
And speaking of packing
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You'll find Gosheron tape
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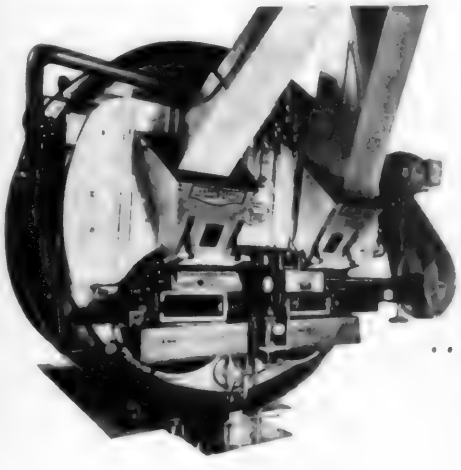

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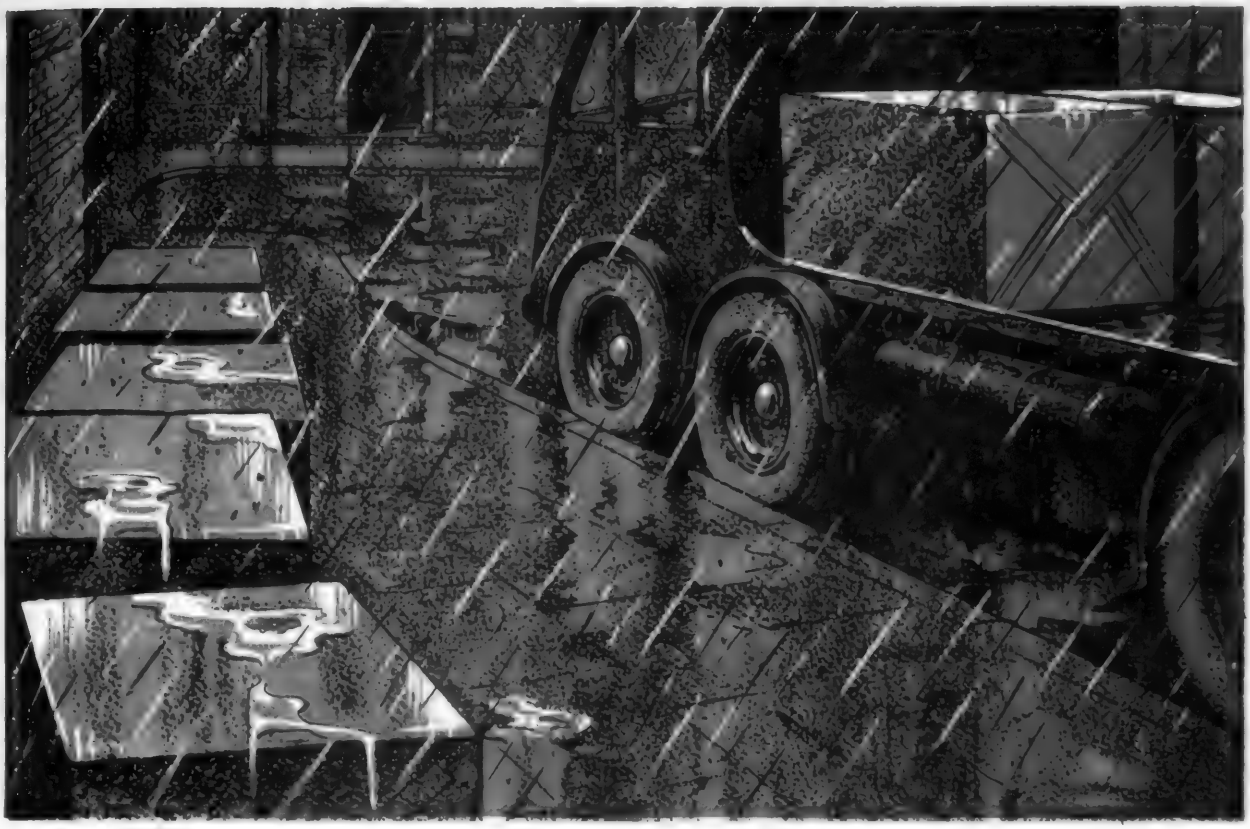

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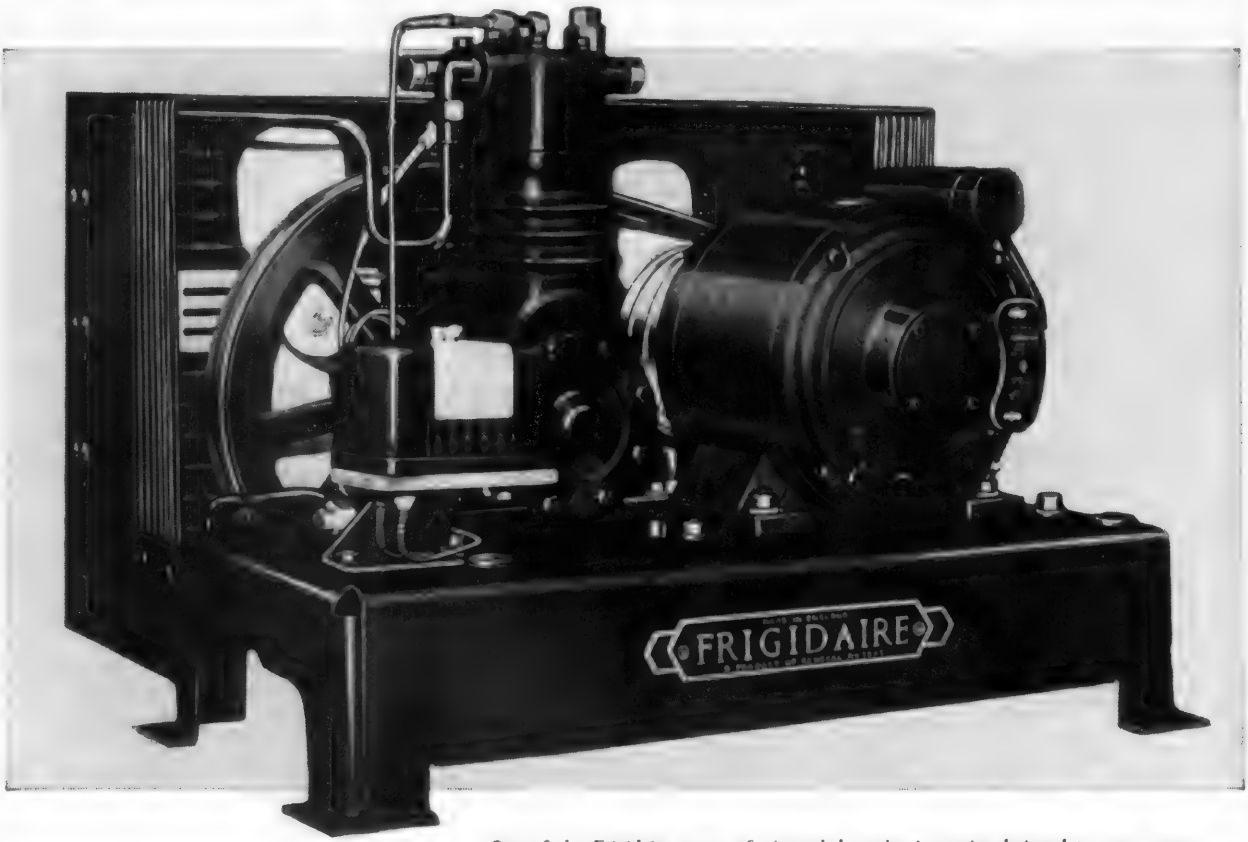

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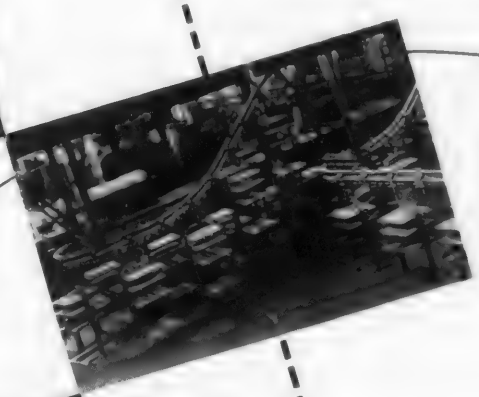

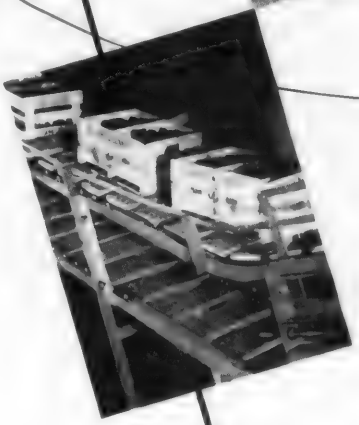

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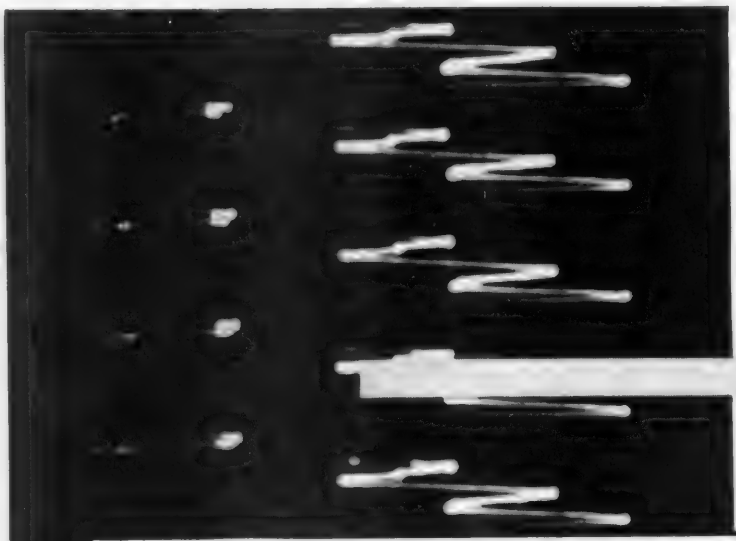
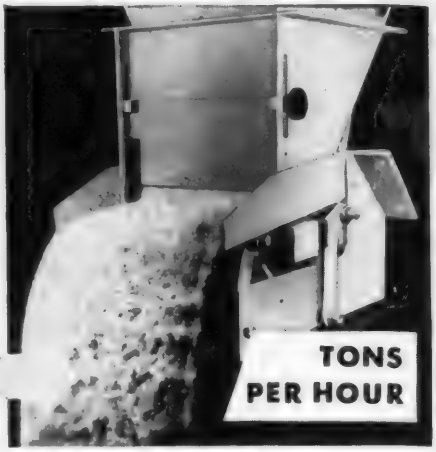
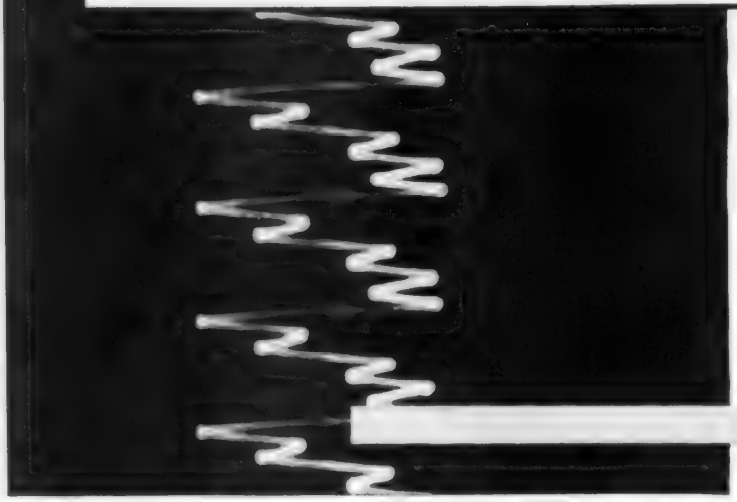




CONTROLLED VIBRATION gives the right feed rates



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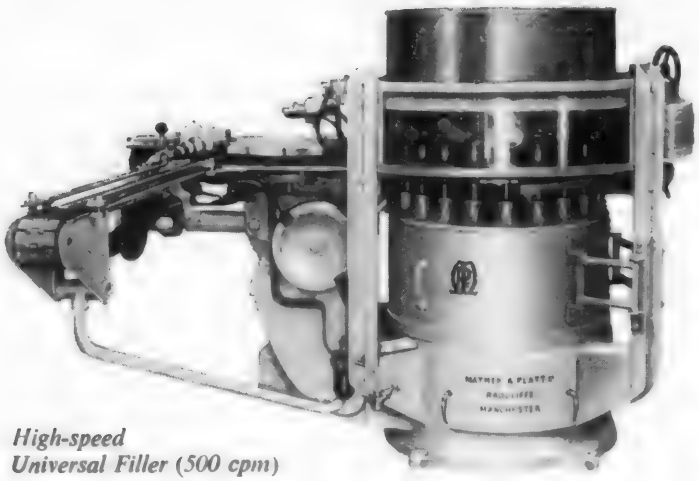

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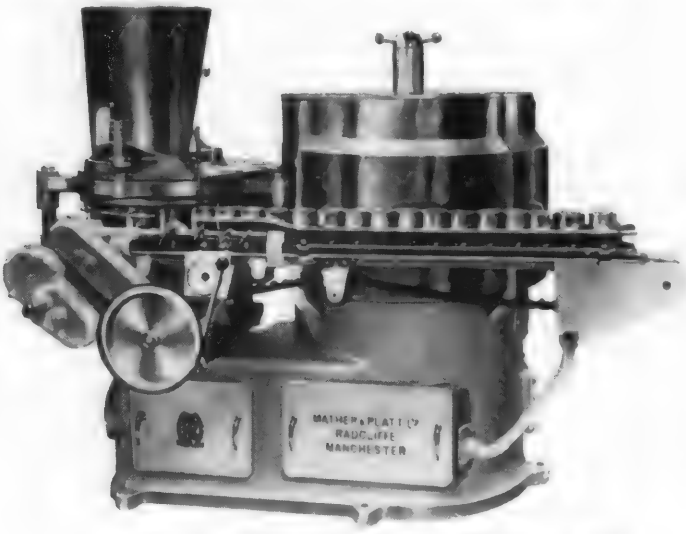

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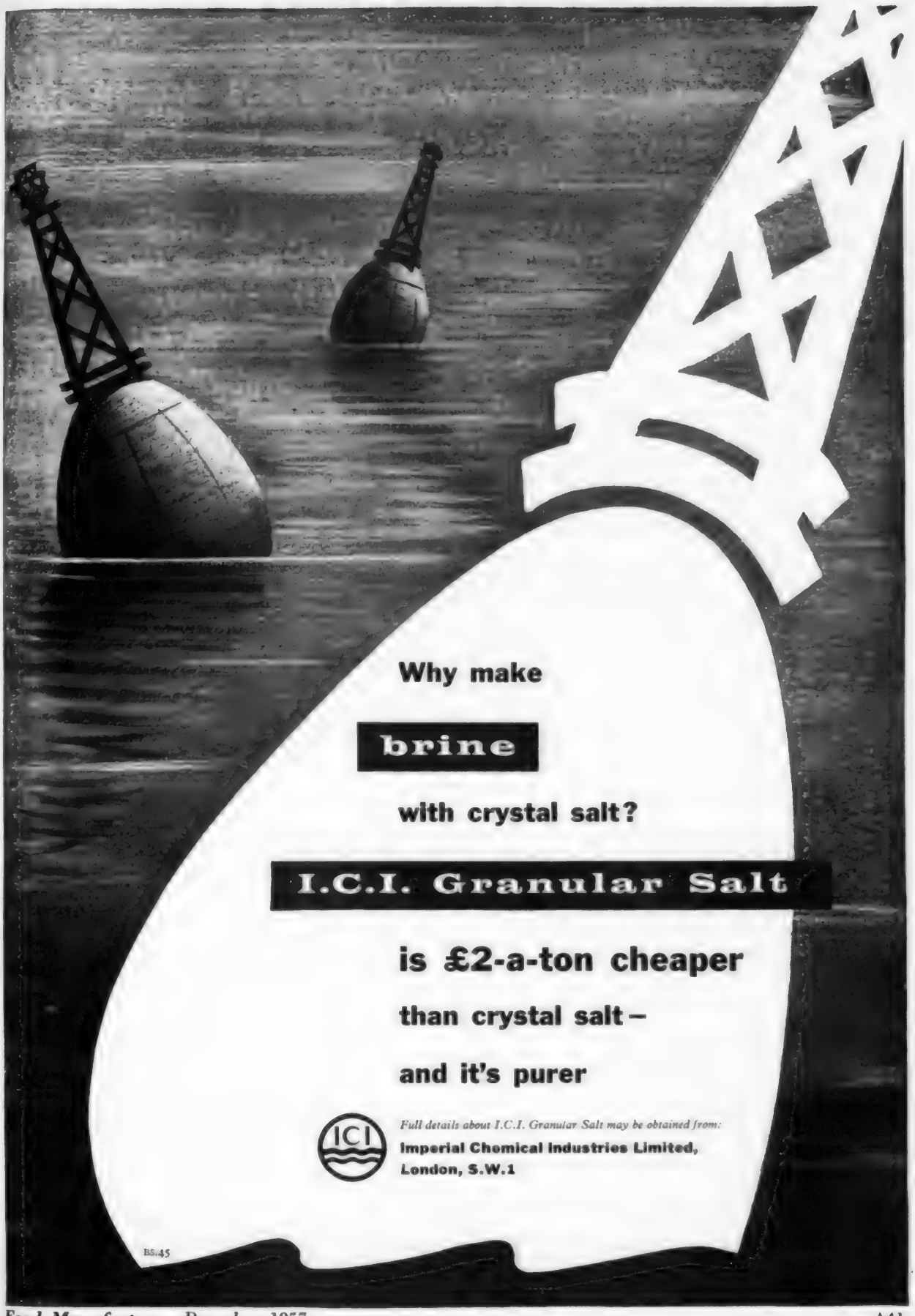
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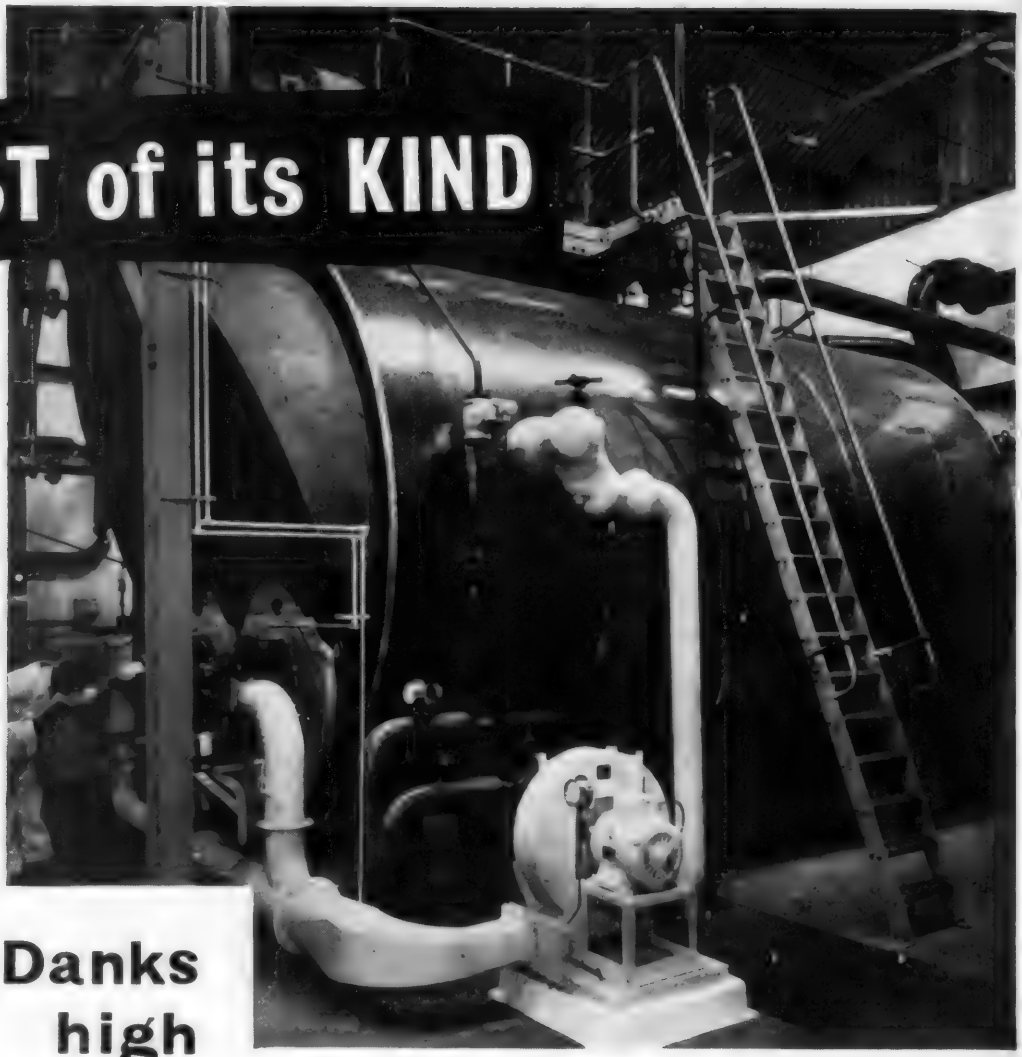

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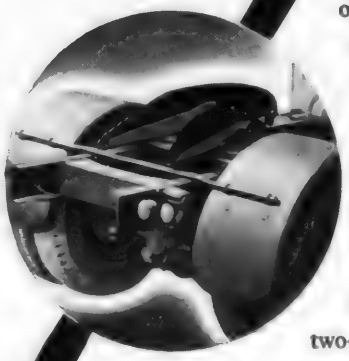

Two new heavy duty tractor models have been added to the Dodge Normal Control range. These tractors have gross train weights of 16 and 18 tons respectively, and are designed to accommodate varying types of semi-trailers of up to 24 ft. in length and having a S.A.E. / S.M.M.T. standard king pin.

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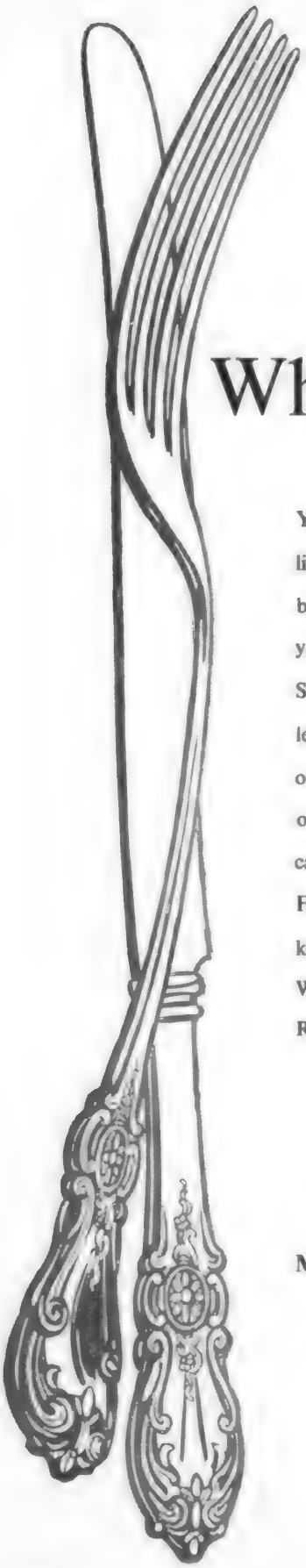

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Model No	HP	A	B	C	Approx. Capacity
1	½	2'–0"	2½"	3"	50 Gal
2	½	2'–6"	2½"	4"	170 Gal
3	1	3'–6"	3½"	6"	750 Gal
4	1½	4'–6"	3½"	7"	950 Gal
5	2	4'–6"	3½"	8"	1300 Gal

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3	¾	3'–6"	2½"	5"	500 Gal
4	1	4'–0"	3½"	6"	750 Gal
5	1½	5'–6"	3½"	7"	950 Gal
6	2	5'–6"	3½"	8"	1350 Gal

★ ***ADJUSTABLE***
to suit plant location and mixing vessel

★ ***MARINE TYPE PROPELLER***
provides more efficient agitation

★ ***TOTALLY ENCLOSED***
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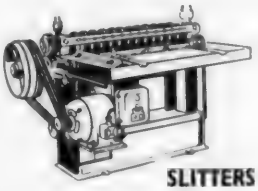

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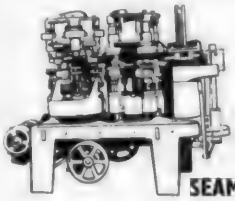

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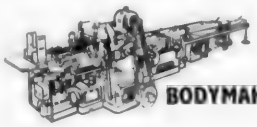

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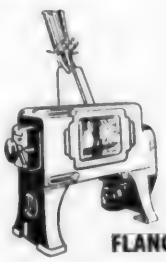
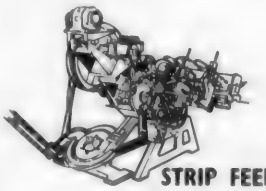
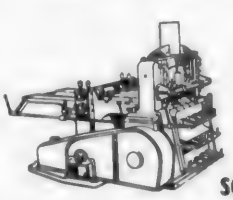


FLANGERS



STRIP FEED PRESS



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Bliss offer a variety of automatic and semi-automatic machines capable of producing cans at up to 300 a minute.

Bliss can probably cut down costs with special purpose equipment if you are running general purpose machinery to produce parts for metal containers, boxes, toys, etc.

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the characteristic of a good High-Sugar Cake

Important role of fat

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When high-sugar cakes were reintroduced after fat rationing ended they opened up a new field. After years of austerity the housewife was ready to sample luxury fare and the high-sugar cakes were very welcome. Because their popularity is steadily increasing, high-sugar cakes are becoming a part of normal cake production.

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CBC make and supply fats for all purposes. Their experience goes back a long way, and their specialist knowledge is at your disposal. If you have a fat problem, don't hesitate to contact our Sales Director. Phone CITy 6783 or write to him at the address below.

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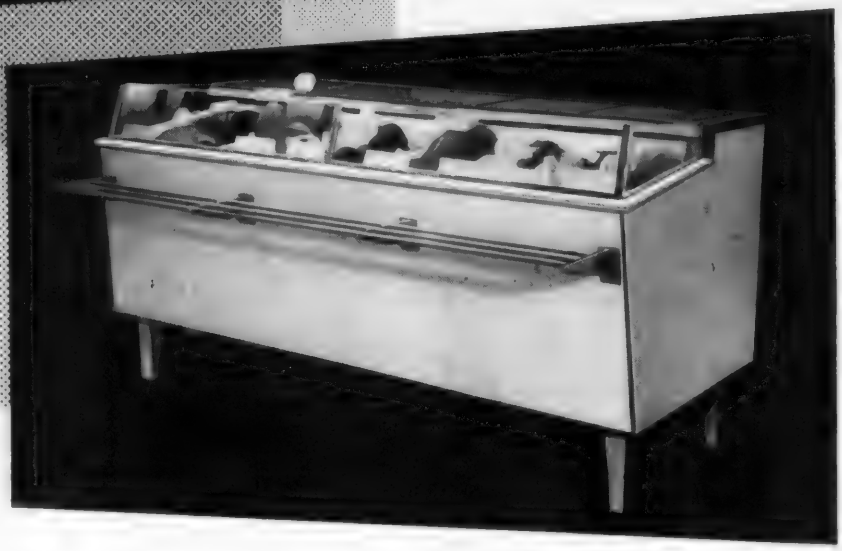

For modern refrigerators and cabinets choose clean, attractive 'Darvic' p.v.c. sheet

Tough, versatile 'Darvic' p.v.c. sheet is the ideal material for up-to-date refrigeration. It is light, easy to shape and has considerable rigidity even in thin sheets. It is completely odourless and does not taint food and drink.

'Darvic' is ideal for refrigerator door panels, facings, and is also used for one-piece shapings for complete interiors. It has great advantages over conventional materials because of its high impact strength and resistance to corrosion. Because of its low thermal conductivity 'Darvic' breaker strips can be incorporated as an integral part of the liner, thus eliminating the cost of separate strips. It makes the attachment of the liner easier.

Crisper trays and other components are readily shaped in attractive colours. The colour range includes multi-colour laminates.

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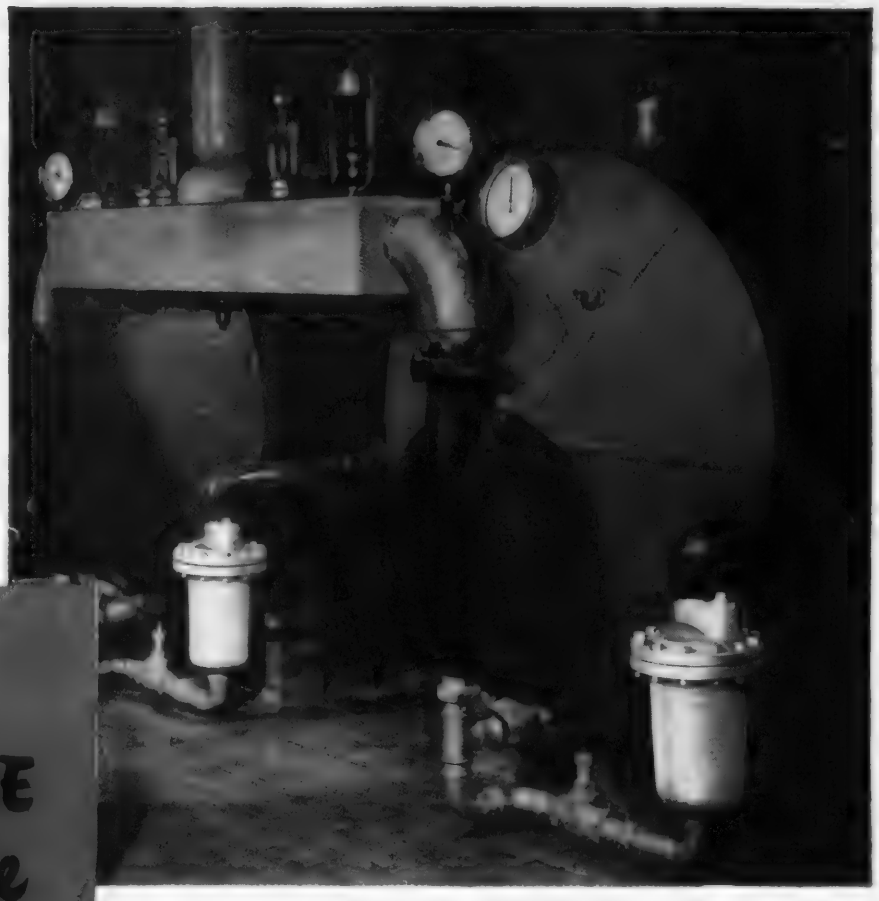
Drayton-Armstrongs on calorifiers at a famous North Country department store: installed for 8 years without any servicing.



You can SEE why the leading firms in Britain use....

Forty-five years ago the first practical inverted bucket steam trap was patented—the Drayton-Armstrong. Today it is the most widely-distributed trap in the world. During those forty-five years it has been the subject of constant test on the bench and in working practice; every new refinement of material and manufacture has been incorporated. The unique Drayton-Armstrong lever system is virtually frictionless, the mechanism has almost unlimited life. Because of its high leverage it will open a larger valve, and handle more condensate than any other trapping system, size for size. There are thousands of Drayton-Armstrongs that have been in use for ten years and more still operating with this unrivalled high efficiency, without a penny spent in servicing in all those years.

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The 'DRICO' Balanced Pressure Trap

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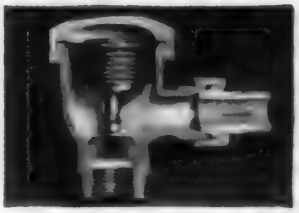

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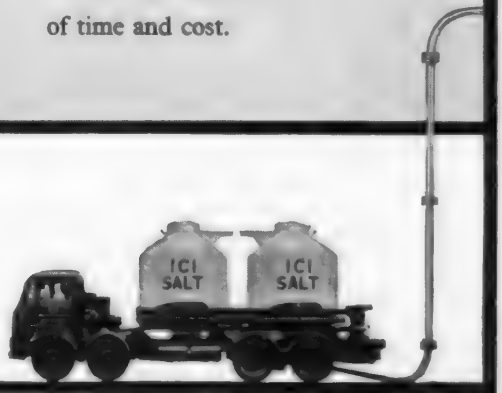

Send now for our free booklet 'Streamlined'—it will give you full details of this new time-and-money-saving service.

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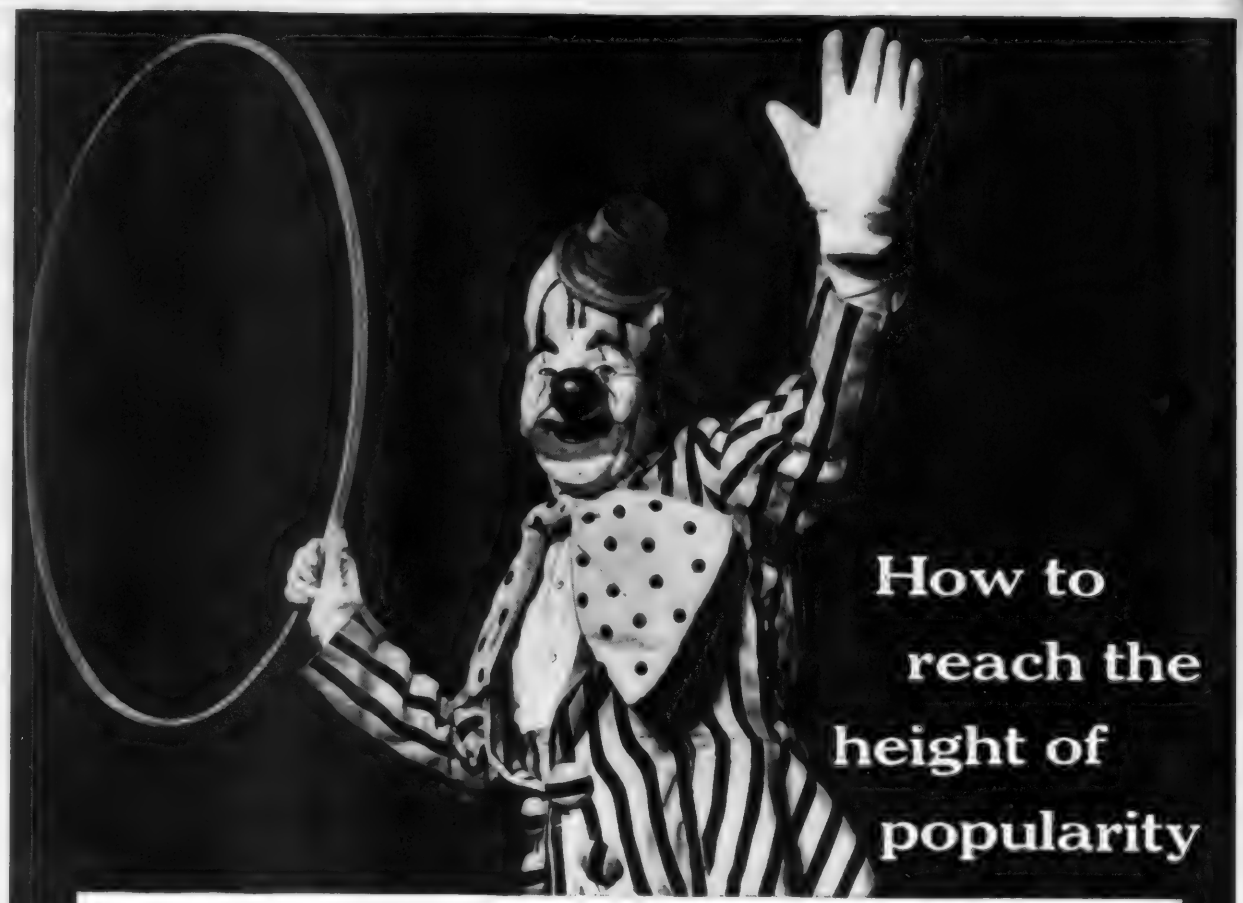

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IT'S THE TOP QUALITY PRODUCT that heads the popularity poll these days. And a top quality product needs top quality ingredients.
Sometimes you have a choice of ingredients. But not with milk. For that irresistible *fresh* flavour you must have GOLDEN GLOW. It's not just the experts who can tell the difference. The public may not know that it's GOLDEN GLOW that makes a product so good, but they *do* know a good thing when they taste it !

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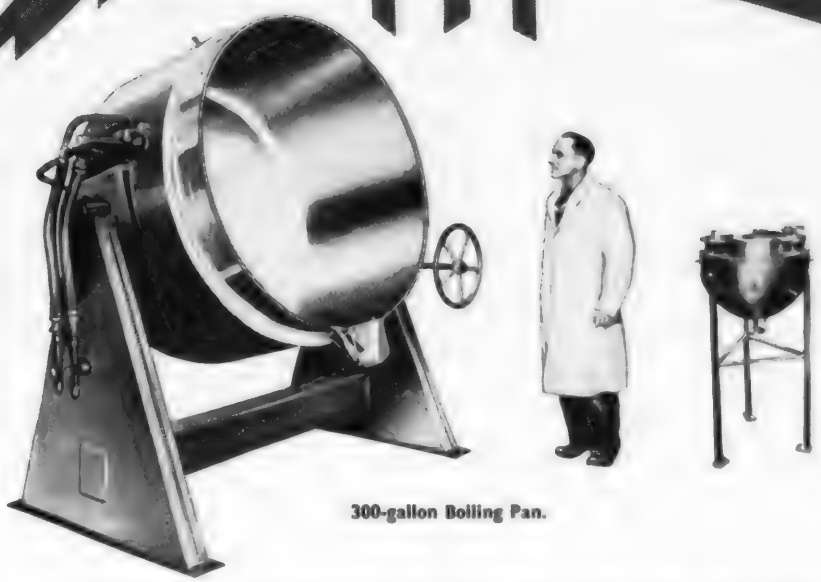

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Formerly the industry relied entirely on imports of lemon juice and citrate of lime from Italy, but in 1930 Sturge introduced a new process for producing chemicals on a commercial scale by mould fermentation. This Sturge fermentation plant was the first of its kind to be operated in this country and finally enabled a by-product of home-grown sugar beet to replace imported materials.

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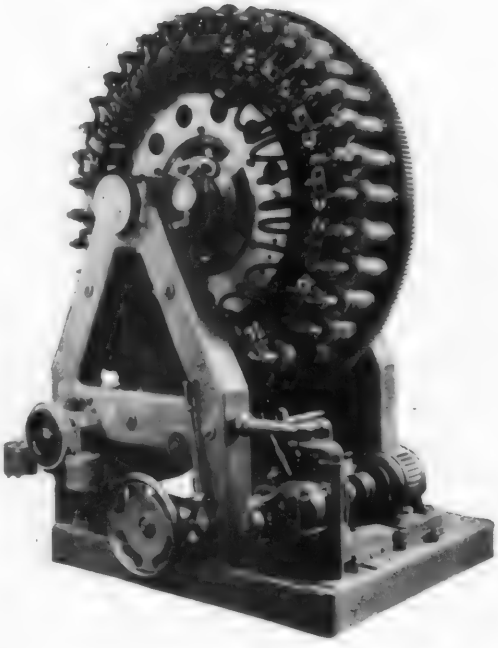

Automatic Can Tester, model 1173
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Output: 300 cans per minute

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2-5 TON PETROL AND DIESEL TRUCKS

with 'full-view' 3-seat comfort cabs and optional overdrive

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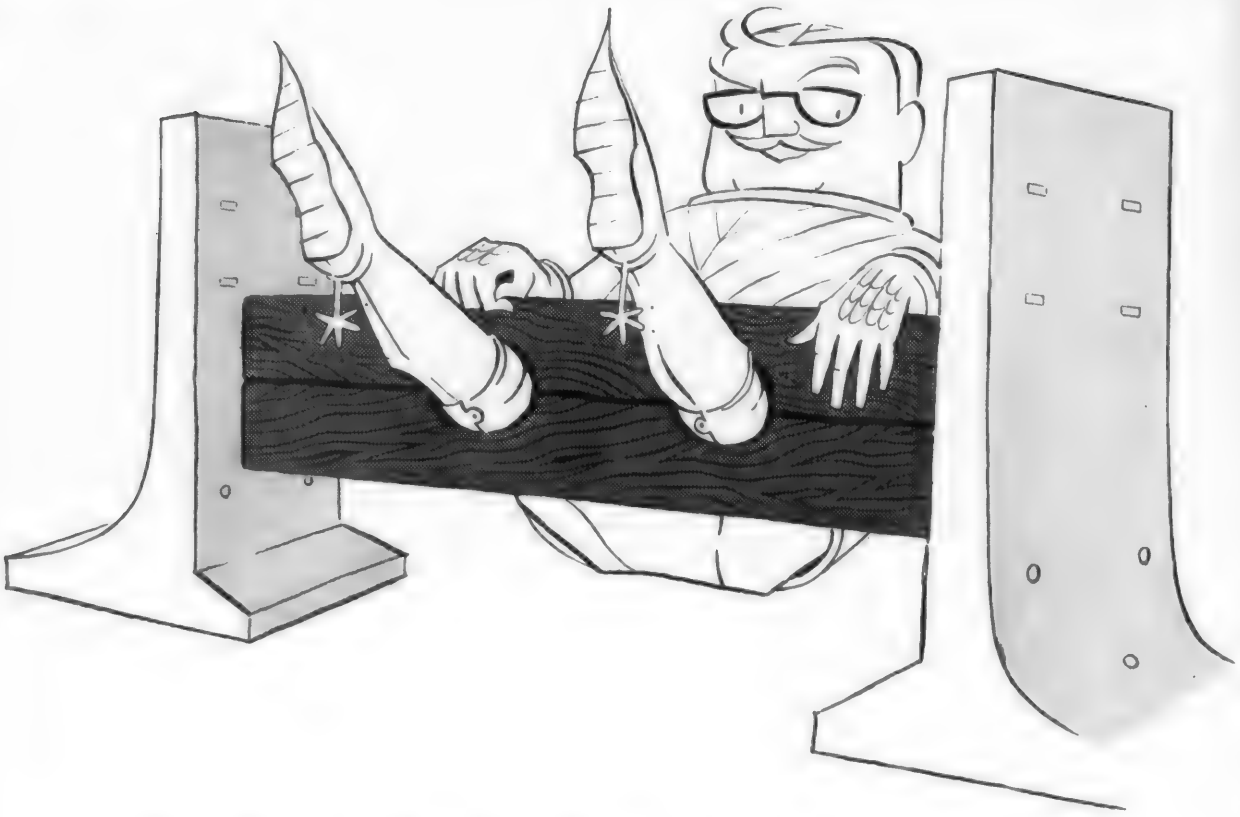

Anchor(ed) **Steel Plates!**

Our Sales Director is quite willing to make a laughing stock of himself in the cause of Stelcon. So here he rests awhile, confident in the ability of Anchor Steel Plates to hold the floor year in, year out, no matter how hostile the traffic. Indeed, the Saucy Knave challenges you to throw anything you like at them as a test ("Not that tomato, sir, if you please . . . the pips get in my joints, so!")

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***NEW!* THE METAL BOX VACUUM DRAWING AND POUCH SEALING MACHINE**

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Metathene is a registered trade mark of The Metal Box Company Limited

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POLYTHENE COATED CELLULOSE FILM

Suggested uses for Metathene

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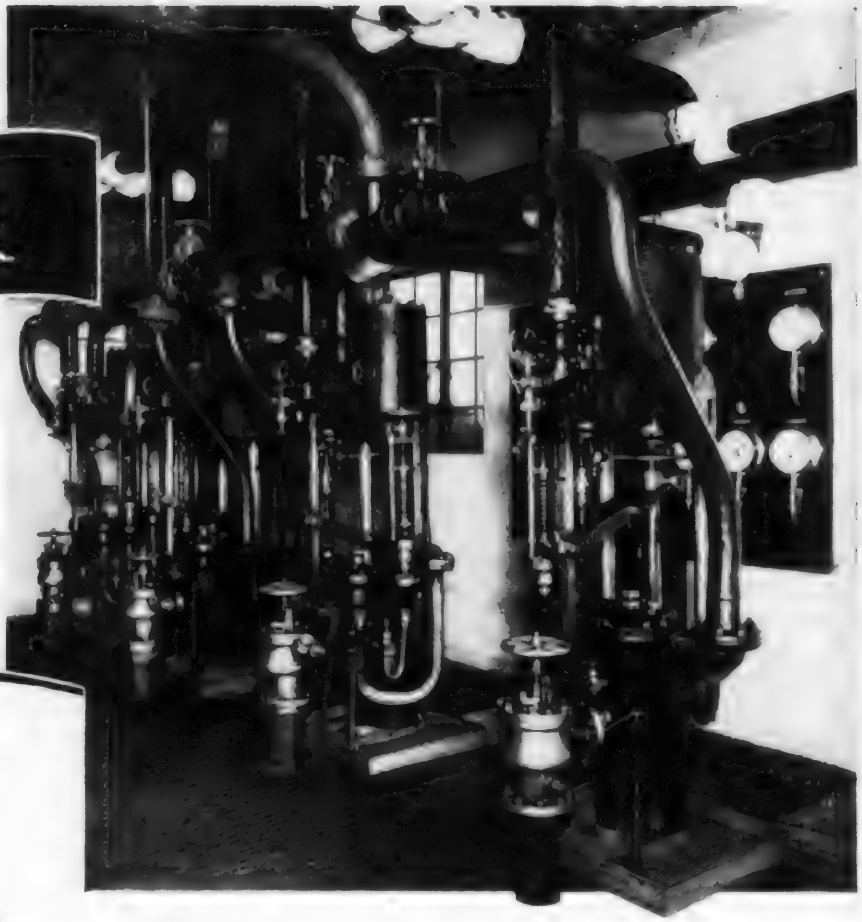

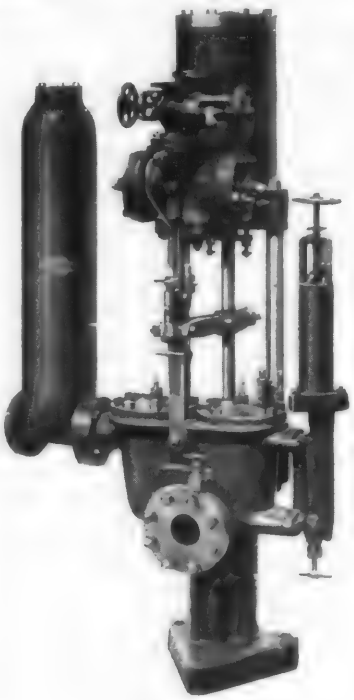

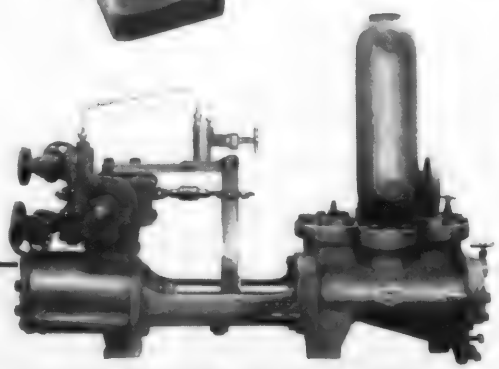

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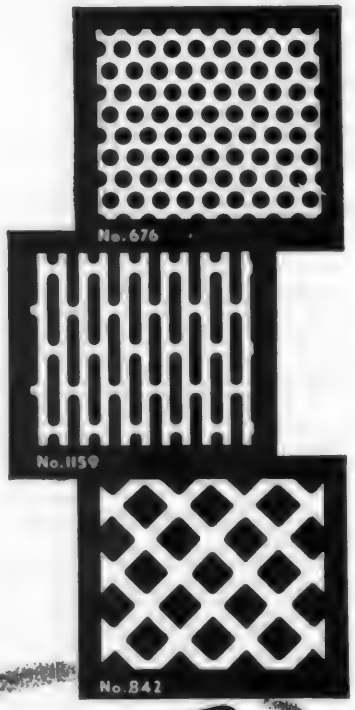

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From 6/1000″ to 250/1000″ depending on sheet size and colour.

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There is too much fuss about getting hot water. If you have steam and cold water all you need is a Leonard *thermostatic* steam and water mixer and you will get all the hot water you want. You will only make as much as you need, you will make it where you want it and when you want it. No storage losses and very little equipment. Leonard *thermostatic* valves provide warm water at uniform temperature automatically controlled by a thermostat within the mixer. Leonard *thermostatic* valves supply hot water for washing filters, dairy equipment, bottles, vehicles, canteen kitchens and many industrial processes.
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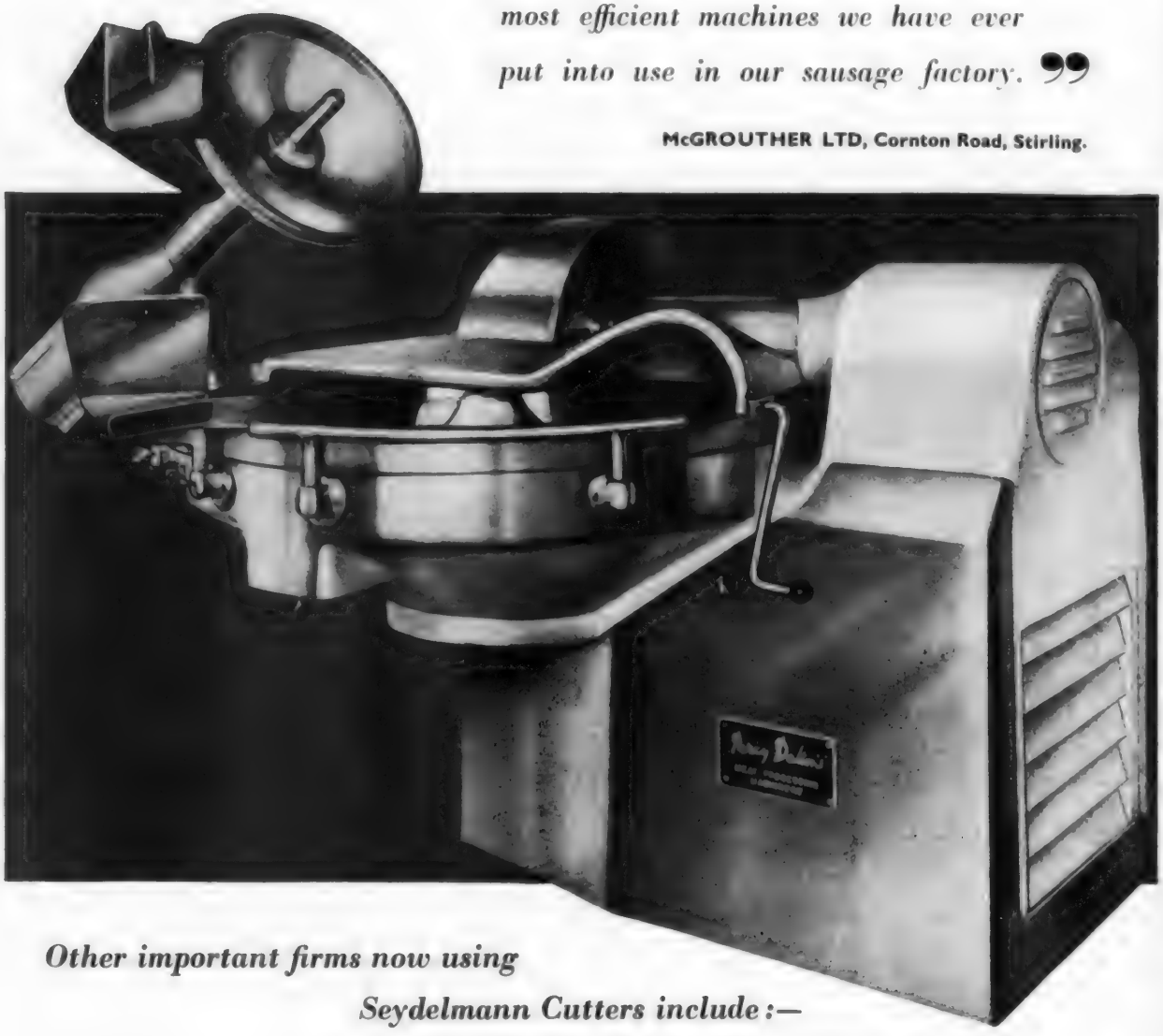

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FOOD MANUFACTURE

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FOOD MANUFACTURE

Vol. XXXII, No. 12 December 1, 1957

Irradiated food by 1960?

IT now appears likely that food preserved with atomic radiations will be consumed on a wide scale within two or three years. According to a report of the U.S. Government's Interdepartmental Committee on Radiation Preservation of Foods, commercial production of foods preserved by atomic rays may begin in 1960. The interdepartmental committee, set up in 1956, includes representatives from the Departments of Army, State, Interior, Agriculture, Commerce, and Health, Education and Welfare, as well as the Atomic Energy Commission. The report points out that by 1960 the wholesomeness and economic feasibility of irradiated foods will have been established, and added that large scale tests being conducted by the army should show whether irradiated foods are acceptable to consumers.

In the forefront in the development of the new food processing technique is the Army Quartermaster Corps which, in co-operation with the Atomic Energy Commission, expects to place America's first food radiation centre in operation early in 1959 at Lathrop, California. The centre's facilities will include an atomic reactor and a high-energy particle accelerator. Its primary mission will be to develop and perfect economic and feasible methods of successful food irradiation.

Reviewing progress to date in the field of food irradiation, the report points out that during 1956 the Army Quartermaster Corps completed a preliminary study of 80 selected foods, obtaining general information to be applied in future operations of the pilot plant. During 1957, research has been concentrated on developing more specific information on certain foods, while other departments are completing initial investigations in areas of product and process development.

At the same time a programme for industry participation at the research and development level has been started and will be expanded as phases of the process unfold. At present, more than 70 industrial firms and educational institutions are participating in the research programme.

During 1958, further taste-testing studies, as well as packing and storage studies, will continue. It is expected that by 1959, as the process reaches an advanced stage, industry participation will increase sharply. Also at this point it is anticipated that pilot plant research on 20 foods and production of merchandisable foods will have started. Much of this food will be used in fulfilling the legal requirements of the Food and Drug Administration for animal and human testing. Information on equipment design will become available as a result of these studies, as well as information on government economic aid which can be extended to the industry.

On p. 559 we publish the second part of a review of British progress in this new field of food processing. Part 1 of this article appeared in our October issue.

Fewer colours, fewer hazards

PUBLIC analysts up and down the country face a lot more work when the Colouring Matter in Food Regulations become effective on December 31. No longer will it be sufficient to decide whether a colour is prohibited or not. In future they will have to make sure that it is one of the 30 permitted colours.

Already a survey has begun of foods containing suspect colours. Brightly coloured sweets are high on the list, as many people will think they should be. Eighteen samples of seaside rock in one survey were found to contain Rhodamine B, which, after June, 1959 (the regulations will come into force gradually), will be a prohibited colour. Another rock contained Brilliant Blue FCF; this also is not on the permitted list.

Faced with the task of examining large numbers of samples containing dyes or mixtures of dyes, the Association of Public Analysts appointed a committee to devise methods of analysis. Wool will be used to separate many of the natural colouring matters from added dyes. The dyes can be stripped from the wool, concentrated and separated into component dyes by paper chromatography.

Separated dyes may also be identified by their absorption spectra, and the committee has prepared spectrograms of all the permitted dyes, which are available to their members.

The net result of the new rules may well be less colour on the confectioner's shelves—but no one in his senses will object to this if it means safer sweets.

Room for British goods

IT is perhaps not generally realised that West Germany ranks ninth in the list of countries to which Britain exports goods. In 1956 she imported goods from Britain worth £92 million, which is nearly 40% of the value of goods exported to Australia, our best customer. A report* has now been issued which should help British manufacturers to do even better in this important export market, and a considerable part of the report is devoted to foodstuffs. The report outlines the general trends in the West German market, and gives a critical examination of British goods as compared with those available from domestic firms. It concludes that the standard of British goods is high, but that there is room for improvement.

Dealing with the packaging and general presentation of foodstuffs, the report points out that self-service marketing is increasing in some areas and now accounts for about 20% of grocery sales, but that the trend is by no means general throughout the country. Packaging essentially for self-service marketing has not yet got really under way among domestic manufacturers, and many of the goods they produce are marketed in a form ill-adapted to the self-service technique. Pre-packed frozen food is not much in evidence as yet, and it would appear that local firms have had difficulty in the conspicuous printing of brand names on transparent film packs. Such pre-packed frozen food as is available is packed mainly in simple flat sachets, with the contents visible. Dry products are being marketed in transparent bags closed at the neck with a simple plastic or metal clip. A limited number of manufacturers appear to have a wide sale for soup powder packed in laminated paper/aluminium foil.

Old-fashioned flat tins are said to be popular for canned fish, though these are now often enclosed in an attractive wrapper or cardboard box. Preserved fruit is preferred in glass containers, as the German housewife likes to see what she is buying. Recent samples of British canned vegetables are reported to have been adversely commented on: the colours used to represent the contents were said to be too vivid and "not quite believable."

British biscuit packs are said to compare favourably with their German counterparts, particularly as regards the standard of printing, but some of the subjects featured on biscuit tins are said to be unsuitable for the German market, and British exporters are advised to take more care in the selection of suitable illustrations.

In the field of sugar confectionery, boiled sweets and caramels are preferred individually wrapped, and they are usually marketed by local firms either loose or in sealed transparent plastic satchels.

* Report on the Packing and Presentation of Goods of United Kingdom Manufacture for the West German Market. Issued by the Board of Trade.

The report concludes that British manufacturers are well-equipped to enter the West German market. The metric system demands the packing of certain commodities in different weights from those used in this country, but these weights are on the whole standardised throughout the Continent, and it is possible to pack metrically for a quite large Continental market.

The lighter side of dietetics

A GREAT deal of information has accumulated in the past few decades about the nutrients which are essential for human well-being. It has been found possible to formulate levels of intake of proteins, vitamins and minerals below which it is not possible to avoid the symptoms of deficiency diseases. There must exist a considerable gap, however, between the levels of intake which are necessary to prevent the clinical signs and symptoms of deficiency, and those which are necessary for the enjoyment of radiant good health. It is extremely difficult, and will probably remain so, to define the extent of this gap; positive good health depends on many factors. But it is by no means impossible to bridge it. In a nation as adequately fed as ours is today, it needs only a wise choice of food on the part of the individual to ensure that all the nutritional needs of the body are fully satisfied.

Unfortunately, such a choice is not always made. For reasons of individual preference, dietary habit, ignorance of facts, or sheer self-indulgence, many people consume a diet which is far from being adequately balanced. And dietetics and good cooking seem to them subjects with little in common.

An attempt is now to be made to improve matters in this respect. In May, 1958, the British Medical Association is organising a national campaign to improve the nation's dietary, and to encourage a generally better balance in the choice of meals. In order to bring home more forcibly the idea that wise eating is not necessarily dull eating, they are to issue as part of this campaign a special *Family Doctor* cookery and recipe book. The title "More Fun With Your Food," should quickly dispel any idea that the book is intended for the crank or the hypochondriac; it is, in fact, intended to give the public, and particularly the housewife, guidance on the subject of getting the greatest possible nutritional value for the money expended on food.

The book has been produced, and is being distributed, with the co-operation of many branches of the food trade, and its appearance should be welcomed by them. At a recent interview with members of the Press, Dr. Harvey Flack, Editor of *Family Doctor*, indicated quite emphatically that the book will do nothing to perpetuate many of the popular prejudices and fallacies which exist about

many classes of foodstuffs, but will, on the contrary, make every effort to explode them. When questioned about the supposed loss of nutritional value associated with the canning and freezing of foods, he was quick to point out that the speed with which foods are delivered to and handled in food factories can often result in the finished product having a higher nutritional value than that of a similar commodity distributed unprocessed through the normal retail channels.

If the book itself proves to be as uncompromising in its declarations, it should prove a welcome antidote to some of the "old wives' tales" which still, to some extent, bedevil the processed food trade.

New high-amylose corn

A NEW type of corn having a high content of amylose —an unusual kind of starch—shows promise as a raw material for many important industrial products, according to the U.S. Department of Agriculture.

Starch from this new type of dent corn contains as much as 80% amylose, compared to 25% found in ordinary cornstarch. Chemists of the Department's Agricultural Research Service are trying to develop strains of corn with even higher amounts of this useful material.

Unlike regular cornstarch, starch from the high-amylose strains is expected to serve as a raw material for making durable fibres, plastics, and transparent films

High-amylose corn hybrids produced thus far in the breeding programme generally lacked desired yielding ability, but strains producing up to 60% amylose with ears and kernels similar to those of ordinary dent corn have been developed by plant breeders. These and other promising strains are the subject of chemical and processing studies at the Department's Northern Utilisation Research and Development Division, Peoria, Illinois.

One of the many products foreseen from this new type of corn is a thin, transparent, edible covering for foods. Such a film could be placed on irregular-shaped foods or food products by dip-coating or spraying. Many industrial uses for the high-amylose starch can be expected if suitable varieties of the new type corn are developed.

Starch from ordinary dent corn is unsuited for spinning into films and fibres, because of its low amylose content. Nevertheless, low-amylose starch made from ordinary corn has many important industrial and food uses, such as for textile and paper sizing, adhesives, oil-well drilling muds, and a wide variety of food products. The new high-amylose corn variety is expected to find new additional industrial outlets.

Food standards

AT present, in the United Kingdom, over £4,000 million a year is spent on food, and this expenditure is by far the largest single item of the individual budget, of which it forms one-third. The expenditure comes to over £80 a year for every man, woman and child in this country. Hence the subject of standards as applied to food is a matter of paramount importance from the point of view both of the public and of the food manufacturer. In a paper presented at the Annual Conference of the Association of Public Health Inspectors at Eastbourne recently, Mr. H. E. Monk, County Analyst for Kent, dealt in a comprehensive manner with the whole field of food standards. He discussed what food standards constitute, the different kinds of standards, the making and enforcing of standards, and their future administration in England and Wales.

Mr. Monk's remarks are in places controversial, and not all food manufacturers will agree with them, but they are none the less worth examining. The Government, he said, has a duty to look after foodstuffs in the consumer's interest, and this duty must broadly be to see that neither his health nor his pocket suffers from what he purchases. The chief provision of the Food and Drugs Act is Section 2, which says that if a person sells an article of food, or a drug, which is not of the nature, or not of the substance, or not of the quality, of the article demanded by the purchaser, he is guilty of an offence. It is when we come to consider what is meant by nature, substance and quality that the function of standards begins to emerge. If he asks for milk, he is entitled to a certain amount of fat; if for sausages, to a minimum quantity of meat. A food standard, therefore, is a definition of the nature or substance or quality of a food, of what may or may not be added to it, of its method of preparation or manufacture, and of the size or amount in which it is presented to the consumer. The relative advantages and disadvantages of standards are readily obvious. The consumer is guaranteed some minimum of quality; the corresponding disadvantage here is that what has been laid down as a minimum may tend, in practice, to become a maximum.

Mr. Monk lists the articles for which there are standards in this country, commenting that it is surprisingly long and very haphazard. We have standards for table jellies, but not for sausages; there is a standard for mustard, but not for the meat on which we put it.

Food standards are made to protect the consumer and for no other reason, said Mr. Monk. If in any particular case it is in the consumer's interest for there to be a standard, then there should be one. In general, standards are not to be made unless ques-

tions of sufficient nutritional or monetary importance are involved. Presumably it is necessary to have, as we do, a standard for curry powder, he said, but it seems very much more important that we should have one for sausages. Standards must be unambiguous, feasible and enforceable. It is idle to pretend that the analyst can solve every problem presented to him; nevertheless, his science, like others, is not static, and he may well be able to do tomorrow what was impossible yesterday. Since the abolition in March, 1953, of the standards for sausages laid down in the Meat Products No. 2 Order, food and drugs authorities have found the greatest difficulty in keeping up the quality. It is possible that there is a case for the prescription of minima for the meat content of meat pies and sausage rolls. A number of canned meat products are showing a progressive tendency towards a lower meat content. Imported articles are leading in this decline and causing unfair competition with home-produced products. Recommendations have been made about standards for processed cheese and cheese spread, and in Mr. Monk's opinion standards or labelling requirements are necessary for certain other types of cheese, notably those made from skimmed or partly skimmed milk. Marzipan ought to be made substantially from sugar and almonds, and a standard is needed to protect the consumer's pocket.

As we emphasised above, many food manufacturers will be far from agreeing with Mr. Monk's views. Where there is deliberate intention to defraud, no one will question the right or the wisdom of a local authority in taking action to protect the customer. This is far removed, however, from agreeing that there should be national standards prescribing what people shall be allowed to eat and, as automatically follows in many cases, what they shall be forced to pay for a given commodity.

We would welcome the views of readers on this extremely vexed question.

More cereals—less porridge

COMPETITION in the sale of breakfast cereals is becoming steadily more intense. The annual sale of this class of foods is now estimated to be about £33 million per year, and to be increasing at the rate of £1 million per year. According to a recent survey in the *Financial Times*, 7 housewives out of every 10 now buy breakfast cereals, although the proportion of people eating them is considerably less than this.

Porridge, however, seems to be losing ground, at least in comparison with the cold cereals, although large amounts have recently been spent in an attempt to popularise it, largely by T.V. advertising.

The large increase in advertising is one of the signs of the growing rivalry in this field. Another is the re-introduction of the pre-war system of giving free gifts for children in—or on—cereal packets, and coupons for premium gift schemes. One of the latest of these gifts is described on our packaging page.

People in this country now eat about twice as much breakfast cereal as before the war, and it is unlikely that those already in the habit will increase their consumption appreciably. The main hope of increasing sales would therefore seem to lie in altering the dietary habits of those people—estimated to be still about 60% of the population—who eat none at all.

The chemistry of flavours

CONSIDERABLE progress is now being made in the chemical characterisation of food flavours. At a symposium held recently at the flavour laboratories of Arthur D. Little, Inc., Cambridge, Mass., over 200 scientists and directors of research met to compare findings. They discussed the flavours of strawberries, citrus fruits, milk, and cheese.

Discussing the flavour of strawberries, Dr. M. J. Winter, representing the Swiss firm of Firmenich, Inc., revealed that this contains such noxious elements as hydrogen sulphide, the characteristic odour-component of rotten eggs, butyric acid, characteristic of rancid butter, and caproic acid, which is reputed to smell of goats. These compounds, along with others, have been isolated in concentrated form, identified, and then recombined in dilute solution to give a natural strawberry flavour.

Dr. Winter offers a note for chefs. When strawberries are crushed, he says, the finest flavour is developed in the course of the first min.; after as little as 5 min. a definite deterioration of flavour is noted, and after 10 min. the alteration is marked.

Dr. Stuart Patton, of Pennsylvania State University, reported that research of milk flavours was now reaching the core of the problem of off-flavours. Several of the substances responsible for various off-flavours had been isolated, including isovaleraldehyde. Dr. Patton also reported progress in the study of off-flavours produced when milk is exposed to sunlight. If riboflavin is removed from the milk before it is exposed, he said, the off-flavours do not develop. They therefore appear to be due to the effect of light upon this substance.

Dr. H. W. Jackson, of Kraft Foods, spoke on the flavour of cheese. He said that the characteristic flavour rests in the fatty portion, rather than in the aqueous constituents. He suggested that one result of present research might be that "matured" cheeses would be produced overnight, without resource to a long ageing process.

Turtles, Birds' Nests and Kangaroo Tails

EASTERN DELICACIES FROM EAST LONDON

When an Englishman thinks of soup, he may think of turtles, but sharks' fins, birds' nests and kangaroo tails are hardly likely to cross his mind. Yet for many years the firm of John Lusty, Ltd., has been engaged in the manufacture of soups from these and other exotic materials. FOOD MANUFACTURE recently visited Lusty's factory in Limehouse, and inspected this unusual branch of food processing.

TURTLE soup has long been prized as a delicacy by connoisseurs of food, and its presence on the menu at large city banquets has become almost traditional. Consisting as it does of protein and other nitrogenous meat extracts, virtually free from carbohydrates and fat, it is ideal as an appetiser and as a stimulant to the digestive juices before the heavier tasks ahead. This stimulatory action, and its high value as a protein food, also make it extremely popular as a food for many invalids and convalescents, and its popularity with the more general public has continued to increase steadily for many years.

The systematic manufacture of turtle soup in England dates back to the early 19th century, when many ships of the Royal Navy, returning from the Ascension Island and West Indies' stations, brought back live turtles as part of their general perquisites. The captains often wished to have these made into soup for presentation to "My Lords of the Admiralty," who already valued this soup highly. Trading vessels also brought their quota of turtles, which were sold or traded for other goods.

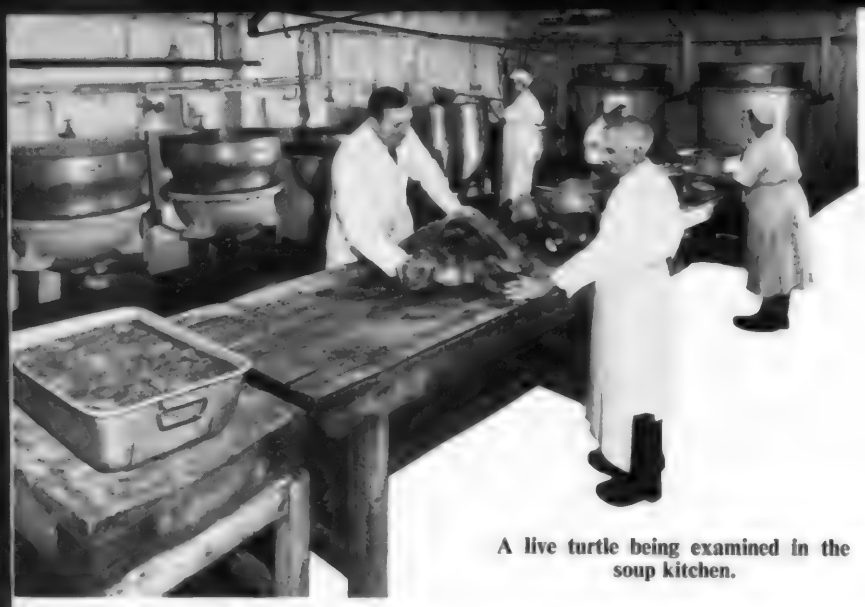
It was in these circumstances that John Lusty, a waterman and ship's chandler, who lived in the fields of Limehouse close to the London Docks and Greenwich Naval Base, was able to establish himself in a new line of business. It was not permitted to slaughter within the City bounds, and Mr. Lusty therefore had the live turtles transported by horse drays to his warehouse outside the City limits, where he had constructed a specially heated indoor pond with a sandy beach and a temperature of between 70° and 80°F. Here the turtles recovered from the rigours of their journey, and were kept in comfort until they were required for the soup pots. Such an enterprise was bound to give rise to a spate of rumours, and it was at one time bruited that the turtles lived in such luxury that champagne and oysters featured large in their diet! Small wonder that the soup into which they were made was famous long before the modern science of nutrition placed its claims on a more rational footing.

Turtle soup today

The business of John Lusty, Ltd., is now carried on by the fourth generation of the family, and is still situated in the Limehouse district. Operations are now under the control of Mr. Ralph Lusty, who, as managing director, combines responsibilities in the fields of purchasing and marketing with supervision of the factory operations. Mr. Lusty is particularly interested in the experimental side of the firms' operations, and in the evolution of new recipes and the development of new products.

Since 1940, the number of live turtles imported into this country has declined sharply, owing to various shipping restrictions and to the fact that modern food technology and the speed of modern transport makes it unnecessary to keep the animals alive. The turtles are now killed by humane killers in tropical ports and shipped in the frozen state. A small amount of meat is also dried, and this is used to a limited extent as garnish in the soup. The turtles used for soup making are of the Green or Edible species (*Chelonia mydas*), which are to be found in most tropical waters. They are omniverous in habit, feeding mainly on turtle grass (a type of seaweed), fish and crustaceans, and may reach a weight of several hundred pounds.

In the preparation of turtle soup at the Lusty factory, the frozen meat is first cut up and then simmered very slowly in large steam-jacketed stock-pots. One



A live turtle being examined in the soup kitchen.

is immediately struck with the difference in time element between the production of this soup and the manufacture of soups of the more common type. In the preparation of most meat and vegetable soups, an hour or two of cooking suffices. Not so with turtle soup. In order that the proteins and other substances may be thoroughly extracted from the meat, a long slow cook is essential, and the 200 gallon kettles are made up with stock over a period of as long as four or five days. As the cooking progresses, vegetables, herbs, spices and other seasonings, and wine are added, and at the end of the cooking period the soup is allowed to settle and clarify, clear liquor then being drawn off for filling into jars, bottles, and cans.

A garnish of more lightly cooked pieces of meat is usually added during filling. This is taken from flesh immediately within the carapace, that from the back, which is greenish black, being known as Calipash, and that from the belly, which is whitish-yellow, being known as Calipee. It is the practice of some manufacturers of turtle soup to use only this flesh in its preparation, but Lusty's have always believed that soup made in this way, though still highly nutritious, lacks the full flavour and nutritive value of soup made from whole turtles. They therefore use the whole of the turtle, shell and all, particularly prizing the fins and the muscle steaks, and removing only the viscera and the fat.

After being filled and sealed, the jars and cans of soup are processed in instrumented, automatically controlled retorts, in which they are also cooled under air pressure, after the requisite period of cooking, by means of water sprays.

The soup is prepared in a range of sizes of glass containers and cans to suit the requirements of different consumers. One of the most popular packs is the individual portion, packed in a 5 oz. can. This is rather smaller than the usual 8 oz. individual soup pack, but turtle soup has been found to be so rich that the smaller size is sufficiently satisfying. Gallon and quart sized packs for the restaurant trade are also popular.

Small quantities of the soup are also prepared in a dried concentrated form. In the preparation of this the clear soup is evaporated until much of the water has been removed, and is then poured into shallow trays and allowed to set, which it does very readily. The solid concentrate is then cut into square pieces of suitable size and dried in an air oven at atmospheric pressure in a current of slightly heated air. The resultant dried portions weigh about $\frac{1}{2}$ oz. each, and when dissolved in water they form enough for a generous helping of soup.

Lusty's recommend that the turtle soup should be served piping hot, with the addition of a little Madeira or sherry just before serving. Lemon and cheese straws are sometimes served with it, with sherry or punch to drink. Alternatively, it may be served chilled in a jelly form, lightly whipped with a fork and served "en tasse," when it makes a light but nutritious meal for a hot day or is most satisfying for an invalid with a poor appetite.

Turtle oil

The fat which is removed from the turtles before cooking forms a useful by-product in the shape of turtle oil. This is a light yellow oil obtained from the turtle fat by a rendering and refining process, and it is in considerable demand for use in soaps and cosmetics. It is reputed to be highly beneficial to the skin, and has been used for many thousands of years for its rejuvenative anti-wrinkle properties. Even Cleopatra is said to have favoured it as a beauty aid. In earlier years Lusty's made it a practice to give away sticks of shaving soap containing the oil, and the demand for these has now become so great that they are being manufactured as a general article of commerce.

Other unusual soups

In addition to turtle soup, Lusty's have long specialised in soups and other prepared foods of an unusual nature. Before the war their list of products numbered over 100, but this has now inevitably been shortened, as the market for some of them was so small as to make their economic production under present-day conditions impossible. It is an unusual fact, and one of which Lusty's are justly proud, that without any lowering of quality they have been able to maintain the price of their turtle soup without increase since pre-war days. This has been possible solely because of increase in demand.

Naturally enough, this increased demand has not been shown for all their numerous pre-war lines, and many delicacies prepared before the war have had to be discontinued. None the less, their list of exotic foods is still impressive. Bird's nest soup has long

been a favoured Oriental delicacy, but it must come as a surprise to many people to know that it is prepared on a commercial scale in England. Yet this is another of Lusty's interesting lines. The nests used are somewhat different from those gracing the English hedgerows, resembling more the nests of swallows that one might find on the rafters of an old barn. They are, in fact, the products of a very small swallow, native to the island of Borneo. These birds nest in caves, where they build five or six half-cup shaped nests, using in the end only one of them. The nests themselves are perhaps 3 in. across, and some 1½ in. deep, and are composed mainly of a mucilaginous material and partly digested vegetable matter regurgitated by the birds.

The nests are imported into this country in a dried state, largely via Hong Kong, and are cooked and blended with vegetables, spices and other ingredients in accordance with authentic Chinese recipes. Chinese sauce is also added, and the soup is garnished with mushrooms and chicken meat.

Another soup of Far Eastern origin is made from sharks' fins. These have a fine inner fibre between the bones or rays which produces a succulent soup considered a great delicacy in the East. The soup is again made according to an original recipe, with the incorporation of the appropriate sauces, and is garnished with bamboo shoots and water chestnuts when these are available.

The interest of Lusty's in producing unusual foods is not confined to dishes of Eastern origin. Another of their products is Kangaroo Tail soup, a dish which is naturally native to Australia. It is, indeed, by way of becoming a national dish in that country; but although it has now, after a period of over 60 years, established a high reputation with gourmets in this country, it is still a new and intriguing dish to most people.

A soup "invented" in America, Cream Vichysoise soup, is another of Lusty's speciality lines. This soup is said to have become a great favourite with Americans, especially when served chilled, with a garnish such as chives and parsley. The soup itself is made from the quite humble ingredients, leeks and potatoes, enriched with spices and liberal quantities of butter and cream.

Mr. Ralph Lusty, managing director (*left*) examining birds' nests prior to their use in the preparation of soup.

From nearer home come recipes for Borsch, a sharp beetroot soup of Slavonic origin, prepared with duck or chicken stock and beetroot, and served with specially soured cream, and Lobster Bisque, from France. This latter soup is made from whole lobsters and garnished with lobster meat. It has proved a difficult item to can successfully, as great care has to be taken if the delicate flavour of the genuine *bisque* is not to be lost. From Italy comes the ever-popular minestrone.

One may wonder, amongst this array of foreign dishes, if Lusty's produce anything with a more domestic origin. They have, in fact, at one time or another made most of the more common soups, and they still make quite a number, including cream soups such as chicken and mushroom. It is not the policy of Lusty's to try to compete in large-scale markets for the more widely popular soups, however, as they feel that their essential role is that of a speciality house, preparing foods that cannot commonly be obtained.

Solid packs

The firm does not devote its attentions exclusively to the preparation of soups, although these form the bulk of its production. Chicken breasts, and the more homely but widely favoured steak puddings and steak and kidney pies are also produced. Even in the field of more solid foods the more exotic soon creeps in, however, and one learns with interest that two of their newest lines, already on sale in America, are turtle steaks in Madeira sauce, and kangaroo venison steaks in red wine sauce. These delicacies are to be introduced to the home market shortly, and one wonders how they will be received in a country of notoriously conservative culinary tastes. In the interest of good and varied living, we wish them every success.

Capital Investment and Productivity in the Food Industries

By Dr. Damazy Jerzy Tilgner

Dr. Tilgner and his colleagues in Poland have attempted to analyse the relationship between capital investment and productivity in 24 branches of the Polish food industry. They claim that their data reflect average Central European conditions which prevailed until a few years ago and still exist in many countries. This unique study provides a yardstick for interesting comparisons between different food industries and different countries.

THE different branches of food manufacture represent a varied picture with respect to the nature and biochemical behaviour of raw products, the technological procedure applied, the plant capacities and seasonal employment, as well as the financial requirements of the productivity of capital assets involved in the different processing plants.

Lack of data

With regard to the latter, very scarce data are found in the literature owing to the fact that the financial aspect is considered a strictly private matter. On that account technologists and businessmen lack yardsticks to compare the amount of capital needed per production unit or per worker, as well as the capital's productivity in the different industries. With the aid of experts every enterprise is able to carry out smoothly its service and profit objectives by intelligent forecasting of the cost of originating a food processing plant and estimating the current expenditures of the future plant's activities in terms of physical units, translated into current monetary equivalents or indirect index values.

Tiega[1] analysed over a number of years the reasons of failure in different branches of the German food industry. He found that in seven cases out of ten the failure was caused by improper budgeting, false financing, and lack of current funds.

Scope of investigation

Money invested in the food industries for productive activity embraces capital expenditures for sites, buildings, equipment, machines, and other fixed assets.

Money is further required for the current needs of the undertaking in operation, namely for raw materials, labour, factory expenses like power, heat, and light, maintenance costs and different general expenses. These expenses have sometimes to be defrayed for a long time before the finished product is ready for shipment and the cash for it comes in.

The aim of our investigation was to determine whether any, and if

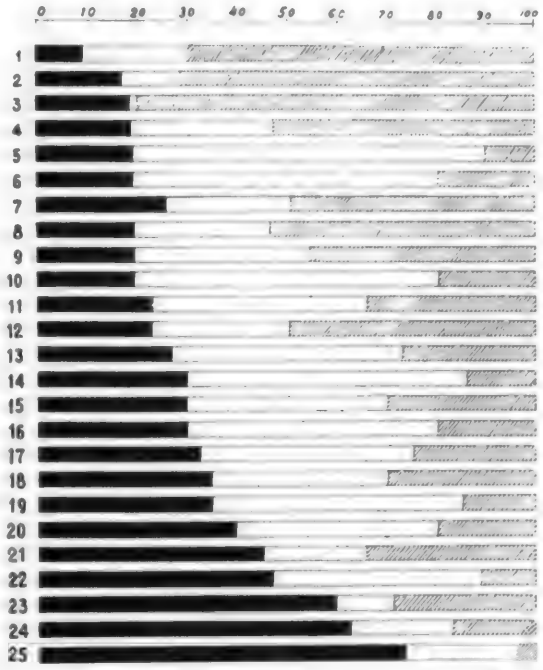


Fig 1. Average Percentage Rates of Total Capital Engaged in Food Industries.

Black—fixed assets for sites and buildings.
White—fixed assets for machines and equipment.
Grey—current capital.

1. Fruit and vegetable canning.
2. Fish smoking and canning.
3. Fruit storage enterprise (ventilated).
4. Bacon factory.
5. Ice cream mfg.
6. Distillery.
7. Glucose syrup mfg.
8. Jam mfg.
9. Beet sugar mfg.
10. Flour mill.
11. Artificial honey mfg.
12. Brewery.
13. Yeast mfg.
14. Vinegar mfg.
15. Fruit juices.
16. Butter mfg.
17. Edible oil mfg.
18. Pickles and sauerkraut mfg.
19. Fruit and vegetable dehydration.
20. Confectionery.
21. Meat canning.
22. Potato starch mfg.
23. Bakery.
24. Fresh meat and meat products.
25. Cold storage warehouse.

Table I. Average Size and Plant Capacity in Analysed Industries

Branch of food industry	Size of plant	Capacity
Grain		
1. Flour Milling	very small	2 ton grain daily
	small	15 ton grain daily
	medium	35 ton grain daily
2. Bakery Products	very small	1 ton bread, 660 lb. others
	small	5 ton bread, 2 ton others
	medium	10 ton bread, 4 ton others
Sugar		
3. Beet Sugar	large	1,500 ton sugar beet daily
4. Confectionery	medium	4 ton daily
5. Ice-cream	very small	2,000 individual slabs per hr.
6. Artificial Honey	large	5 ton per 8 hr.
Fruit and Vegetables		
7. Fruit and Vegetable Cannery	small	450 ton per season
	medium	800 ton per season
8. Pickles and Sauerkraut	small	600 ton kraut, 250 ton cucumbers per season
9. Dehydration Plant	very small	1·1 ton raw products
	medium	9 ton raw products daily
10. Jams and Preserves	very small	100 ton per season
	small	700 ton per season
	medium	2,100 ton per season
11. Sulphured Fruits	small	100 ton pulp per season
12. Fruit Juices	very small	6,000 gal. per season
	medium	60,000 gal. per season
Milk and Milk Products		
13. Butter	very small	3,000 quarts milk daily
	medium	12,000 quarts milk daily
	large	30,000 quarts milk daily
Edible Oils		
14. Oils, Edible	small	10 ton oil seeds daily
	medium	40 ton daily
Meat and Meat Products		
15. Fresh Meat and Meat Products	very small	1 ton meat animals weekly
	small	4·5 ton meat animals weekly
	medium	17 ton meat animals weekly
*16. Bacon Factory	medium	800 pigs weekly
†17. Meat Canning	medium	5 ton canned, 2 ton meat products daily
Fish Products		
18. Fish Smoking and Canning	medium	1,500 ton per season
Fermentation		
19. Distillery	very small	6 ton potatoes daily
20. Yeast Mfg.	medium	5 ton yeast daily
21. Brewery	medium	4·5-6 thousand gal. yearly
22. Vinegar	small	12 thousand gal. alcohol per year
	medium	24 thousand gal. alcohol per year
Other Industries		
23. Potato Starch	small	20 ton potatoes daily
24. Glucose Syrup	medium	20 ton syrup daily
25. Cold Storage Warehouse	medium	2,500 ton capacity
26. Fruit Stores	small	100 ton apples per season

* The Polish bacon factories worked mostly on a rented basis in municipal slaughterhouses, hence fixed expenditures comprised mainly adaptation cost without investing into sites, buildings, cold storage facilities, etc.

† Meat canneries did not have slaughtering facilities.

so, which branches of the food industry group need more expenditures for fixed assets than for current needs—whether the utilisation of this capital investment, *i.e.* the annual turnover of this capital, is equal in all branches, and if not, in which it is faster or slower.

Our data are designed to compare the size of capital requirements for both fixed and current needs with the annual sales value of manufactured goods. Such comparison may illustrate the normal turnover of the capital engaged and *ceteris paribus* the productivity of said capital.

We may take it for granted that applying an identical profit margin and working with similar plant and organisation efficiency a higher annual capital turnover depicts a greater capital productivity and better earnings of the capital engaged. Is there any peculiar differentiation specific to some industries, whereby some branches are in a more favourable position than others?

It may be assumed that the higher the mechanisation of production processes and the more efficient the handling of materials, the greater must be the capital expenditures for equipment, machines and other fixed assets, whereas the current expenses may diminish in the percentage of the total capital engaged. Have small undertakings a more favourable utilisation of capital engaged per unit of capacity than medium-sized or large food enterprises?

These and similar problems are of interest not only to executives of particular branches and undertakings of the food industry as a whole, but as well to those engaged in economic and investment planning on a country-wide scale. The more intrinsic knowledge of the required sums and the productivity of capital investments may save many disappointments to those who rely on borrowings. Banks are timid lenders, unwilling to make unsecured advances.

Method of analysis

The data presented were computed from a detailed analysis of 24 different branches of the food industry in Poland operating under free market conditions and normal price levels resulting from an unrestricted supply and demand system. The industries reviewed were composed of independent concerns of different size and different, mostly medium, efficiency, appropriate to the production capacity as stated in Table 1 and found generally in Central European conditions.[2] Average data regarding size and extent of operations, number of persons employed, necessary capital investments, sales value and capital turnover were determined. For control purposes our data was discussed critically and frankly

Table 2. Turnover of current capital

Processing section	Industries	Size of plant	Turnover of current capital: theoretical (days)	in practice (days)	times annually
Short up to 100 days in a year	1. Sugar Production ...	large	5	200	1·7
	2. Potato Starch ...	small	6	40	4·5
	3. Fruit and Vegetable Canning	small	10	150	2·0
		medium	10	150	2·2
	4. Fruit Juices	very small to medium	6	90	4·0
	5. Artificial Honey ...	medium	5	14	4·5
Medium up to 200 days in a year	1. Distillery	very small	28	50	4·0
	2. Brewery	medium	14	140	2·0
	3. Edible Oils	small to medium	6	30	9·0
	4. Fish Smoking ...	medium	2-4	6	3·8
	5. Vegetable Drying ...	medium	6	30	5·5
	6. Jam Making	small	6	30	5·5
Long over 200 days in a year	1. Flour Milling... ...	small	15	20	15
		medium	15	20	7·5
	2. Bakeries	very small	3	22	7
		small	3	22	10
		medium	3	22	11
	3. Butter Production ...	very small	3	10	13
		medium	3	10	19
		large	3	10	18
	4. Confectionery ...	medium	10	50	6·7
	5. Fresh Meat and Meat Products	very small	3-4	14	28
		small	3-4	14	25
		medium	3-4	14	25
	6. Bacon	medium	21	21	18
	7. Meat Canning ...	medium	3-23	4-23	14
	8. Yeast Mfg.	medium	6	30	10
	9. Vinegar	small to medium	6	18	20
	10. Cold Storage Warehouse ...	medium	6	35	11

with leading specialists in the respective branches, who were connected with them as owners, directors or managers of different plants. It was possible to conduct such a frank discussion during a period when these data ceased to be carefully guarded business secrets. Bank balance sheets and profit-and-loss statements could not reveal the required data and were hence omitted.

The total capital engaged was divided into three general groups:

1. Fixed assets invested into sites and buildings.

2. Fixed assets invested into machines and equipment of the plant.

3. Current capital for all production costs.

The expenditures at (1) and (2) compose the total fixed assets of the enterprises. Adding the current costs we obtain the total capital engaged. The source of capital, whether private means or borrowed funds, was of no interest in our scope of work. For simplification the data are presented in a computed form in order to omit money exchange rates.

Fixed assets

It has been found that a considerable number of food industries require a much larger initial investment than working capital for current needs. This preponderance is probably typical even for highly seasonal industries. Only four specific branches require for each monetary unit spent for fixed assets an identical money engagements for current costs. These four industries are sugar, glucose syrup, bacon, and beer production.

On the other hand the fruit and vegetable canning, fruit storage, jam making and fish smoking and canning industries require a larger proportion of capital means for current expenses than for fixed assets (Fig. 1).

Turnover of current capital

In practice there is a considerable difference between the theoretical and the practical turnover of current capital, *i.e.* the time lapse which takes place from the moment the raw product is paid for, until it is processed into manufactured goods ready for shipment and delivered and until the payment for these goods is due. In theory it takes around six days to manufacture bakers' yeast and distribute the product, but in practice a yeast plant needs three to four weeks until the production and payment schedule for said party may be considered as accomplished. The time lag may differ considerably according to the selling policy of the concern and the prevailing customary trade rules. Our figures may thus serve only for comparative purposes. *As a rule each plant should have sufficient current capital to meet all manufacturing expenses during the period which elapses between the theoretical and practical turnover of current capital* (Table 2). The demand for current capital may be very consider-

Table 3. Production Costs in Different Food Industries[3]

Division of expenditure incurred in converting raw material into a finished product.

Branch of food industry	Raw materials supplies packaging material	Labour	Other manufacturing costs
1. Meat and Meat products	89·2	1·5	9·3
2. Cooking Oils, Shortening and Margarine ...	88·5	2·8	8·7
3. Milk and Milk Products	87·5	2·9	9·6
4. Confectionery	87·5	5·4	7·3
5. Distilleries and Brandy	86·3	3·8	9·9
6. Fruit and Vegetable Products	83·8	4·7	11·5
7. Fish Products	82·0	4·2	13·8
8. Eggs and Poultry	75·0	5·6	19·4
9. Potato Starch and Syrup	65·1	7·3	27·6
10. Beet Sugar	63·1	9·3	27·6
11. Breweries and Malt	50·7	10·0	39·3
12. Animal By-products	47·0	20·1	32·9
13. Yeast Production	46·4	12·7	40·9

Table 4. Productivity Index of Fixed Assets and Total Capital in Different Food Industries

Branch of industry	Size of plants	Ratio: Fixed assets to current capital	Productivity index of: Fixed assets (Annual sales / Fixed assets)	Productivity index of: Total capital engaged (Annual sales / Total capital)
Grain				
1. Flour Milling	very small	12 : 1	1·5	1·38
	small	4 : 1	3·7	3·0
	medium	2 : 1	3·75	2·5
2. Bakeries	very small	3·5 : 1	2·0	1·4
	small	2·5 : 1	4·0	3·0
	medium	2·4 : 1	4·0	3·5
Sugar				
3. Beet Sugar	large	1·1 : 1	1·4	0·8
4. Confectionery	medium	4 : 1	4·3	3·0
5. Ice-cream...	very small	8 : 1	2·5	2·3
6. Artificial Honey ...	large	1·2 : 1	3·7	2·0
Fruit and Vegetables				
7. F. and V. Canneries ...	small	1 : 2	4·0	1·34
	medium	1 : 2·3	5·2	1·6
8. Pickles and Sauerkraut ...	small	2·2 : 1	1·3	0·9
9. Dehydration Plant ...	very small	6 : 1	1·0	0·84
	medium	5 : 1	1·0	0·85
10. Jams and Preserves ...	very small	1·9 : 1	5·2	2·0
	small	1 : 1·3	6·5	3·0
	medium	1 : 2·1	11·3	3·6
11. Sulphured Fruits ...	small	1 : 1·5	3·8	1·5
12. Fruit Juices	very small	4·5 : 1	0·8	0·75
	medium	1·5 : 1	1·6	1·15
13. **Butter Mfg.**	very small	4·6 : 1	2·8	2·3
	medium	4·3 : 1	4·4	3·6
	large	2·5 : 1	7·3	5·3
14. **Edible Oils**	small	3 : 1	3·0	2·23
	medium	3 : 1	3·1	2·2
Meat and Meat Products				
15. Fresh Meat and Meat Products	very small	9 : 1	3·0	2·7
	small	5·5 : 1	5·3	4·3
	medium	3·5 : 1	7·2	5·6
16. Bacon Factory	medium	1 : 1·1	28·0	10·0
17. Meat Canning	medium	1·9 : 1	7·4	4·8
18. **Fish Smoking and Canning**	medium	1 : 2·4	9·6	2·6
Fermentation				
19. Distillery	very small	4 : 1	1·1	0·9
20. Yeast Mfg.	medium	2·7 : 1	3·7	2·5
21. Brewery	medium	1 : 1	2·1	1·05
22. Vinegar Mfg.	small	10 : 1	2·0	1·8
	medium	5 : 1	2·5	2·2
Other Industries				
23. Potato Starch Mfg. ...	small	7·5 : 1	0·6	0·53
24. Glucose Syrup Mfg. ...	medium	1 : 1	1·5	0·75
25. Cold Storage Warehouse	medium	26 : 1	0·4	0·37
26. Fruit Stores Ventilated...	small	1 : 4	6·1	1·2

able, if the supply of raw products is highly seasonal.

From our point of investigation it makes no difference whether the current financial needs are covered by own resources or by borrowed means from different sources of credit, although the matter of temporary loans may exert a great influence upon the financial welfare of the enterprise.

Some branches of industry, *e.g.* the central European breweries, tolerate by tradition a very slow payment of bills. Thus the annual turnover of current capital may show great variations in different countries but is in general considerably faster in industries having a long processing season as shown in Table 2.

One may expect that the faster the turnover of capital requirements necessary for current expenditures, the smaller the total amount of money needed for these current needs and thus the larger the savings and profits of said enterprise or branch of industry.

Current expenditures

The expenses which have to be met with currently include not only the prime costs of raw materials, supplies and package material, but also the cost of direct labour combined with the manufacturing process and all indirect general expenses necessary for the production and disposal of the product.

Contrary to general belief the costs of raw materials, auxiliary supplies and packaging material applied to the finished product affect a great portion of current expenses as shown in Table 3.

Capital productivity index

The productivity of capital funds engaged in industrial enterprises is of special importance in underdeveloped countries which lack capital. Such countries have to conduct a carefully planned and controlled investment policy aiming at a maximum productivity of the invested sums.

The capital productivity index reflects the value of manufactured goods produced annually for each monetary unit invested in said manufacture. By dividing the annual sales value of manufactured goods by the total sum invested as fixed assets or by the total capital engaged we receive the respective productivity index.

Taking flour milling as an example, each pound sterling invested in fixed assets produces £1·5—£3·75 worth of manufactured goods annually, whereas the productivity index of fixed assets in the meat and some other industries is much higher, as may be seen from Table 4.

Although the index figures presented may vary in different countries and conditions, the data permit some general conclusions:

1. Particular branches of the food industry are marked by

characteristic frequencies of turnover of the capital investment.

2. This capital productivity may be either low, medium or high.

3. It may be assumed that the capital productivity has a definite influence on the economic results and the profitableness of the particular enterprise and also upon the costs.

The highest capital productivity index (from 10 to 5 capital turnovers a year) is found in the bacon, dairy and meat industries. Medium frequency (about twice a year) is found in the fish, yeast, vinegar and vegetable oil industries, while low frequency (from twice to 0·37 times a year) is found in the cold-storage, syrup, starch, and fruit juices industries (Fig. 2). The duration of the manufacturing season has an influence on the economic result, since the average utilisation of plant facilities shows cyclic changes and operating interruptions burden the capital productivity index.

Under centralised planning and a controlled market scheme the frequency of capital turnover proved to be considerably lower than the figures presented in this paper as a consequence of the necessary and various control measures exerted upon the production and prices and also due to the centralised system of supply and distribution.[4]

By increasing controlled prices these conditions could be in the last five years considerably improved, approaching the productivity indexes of a free market system. Furthermore, the fiscal pricing of meat products permits the attainment of a very high profitability and enables at present well-conducted large meat enterprises to recover in approximately three years their whole fixed assets.[5]

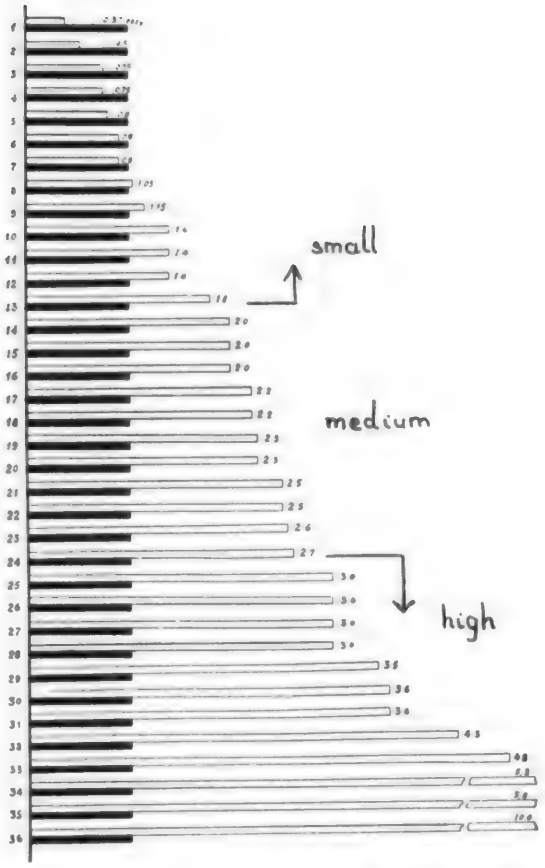


Fig. 2. Productivity Index of Total Capital in Different Food Plants.

Index data show the turnover of total capital engaged, *i.e.* dividing annual sales value by total capital (black).

1. Cold storage warehouse, m.
2. Potato starch mfg., s.
3. Glucose syrup mfg., m.
4. Fruit juices plant, s.
5. Beet sugar plant, l.
6. Distillery, s.
7. Pickles and sauerkraut plant, s.
8. Brewery, m.
9. Fruit juice plant, m.
10. Fruit and vegetable cannery, s.
11. Bakery, s.
12. Flour mill, s.
13. Vinegar plant, m.
14. F. and V. dehydration plant, s.
15. Jams and preserves, s.
16. Artificial honey plant, l.
17. Edible oil plant, s.-m.
18. Vinegar plant, m.
19. Butter mfg., s.
20. Ice cream plant, s.
21. Yeast plant, m.
22. Flour mill, l.
23. Fish smoking and canning, m.
24. Fresh meat and meat prod., v.s.
25. Jams and preserves, m.
26. Confectionery plant, m.
27. Bakery, m.
28. Flour mill, m.
29. Bakery, l.
30. Jams and preserves, l.
31. Butter plant, m.
32. Fresh meat and meat prod., s.
33. Meat cannery, m.
34. Butter plant, l.
35. Fresh meat and meat prod., m.
36. Bacon plant, m.

v.s. = very small. s. = small. m. = medium. l. = large.

Observations in Federal Germany

Observations made by the author during a recent visit to Federal Germany suggest that larger plants show on the whole a better productivity index than that stated above. For example, large fruit and vegetable canning plants with a production of well over 2 million 1 kg. units of canned goods per year, and over 1 million glass packs of preserves, produced mainly in the off season, have a productivity index of 2 to 2·5.

The productivity index of cold storage warehouses depends to a considerable degree on the storage rates charged to the customers. With an annual utilisation of 70% of the available storage space the average productivity index of Federal German cold stores amounts to 0·65, and is considerably higher than is stated in this paper. This descrepancy has resulted from the unusually low storage rates charged in the Polish cold storage industry at the time of our investigation.

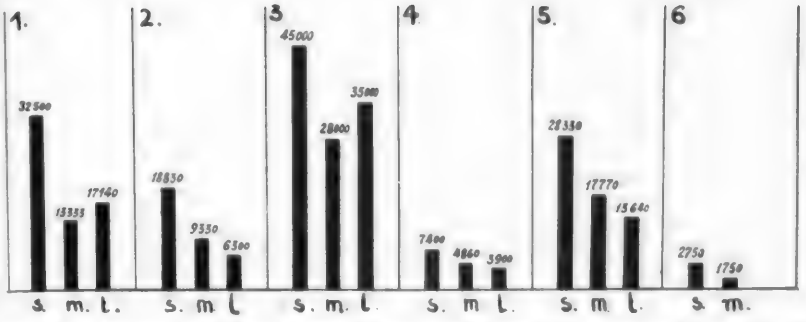


Fig. 3. Comparison of Total Capital Required in Small, Medium, and Large Food Plants per Unit of Production Capacity.

(in zlotys (£1 = 26·10 zlotys).

s(mall), m(edium), l(arge) plants

1. Flour Mills per ton
2. Dairies per 100 tons
3. Bakeries per ton
4. Jam Mfg. per 10 tons
5. Fresh Meat and Meat Products per ton
6. Fruit Juice Mfg. per 1,000 litres.

Size of plant

Without going into details, the analysis disclosed furthermore that *small undertakings in the food industry require as a rule more than twice as large an investment of capital per unit of production as do the medium-sized and large-scale plants* (Fig. 3). In its effect upon country-wide investment this means the possibility of increasing the productive capacity of a country at least twofold without the need to increase correspondingly the total sum designed for investment in any branch of the food industry.

It is obvious that the above statement cannot be applied automatically in general investment plans, since there exist specific interrelations between the supply and the distribution of highly perishable products. The planning of gigantic manufacturing plants in the food industry requires very careful consideration and has its limitations as proved in quite a number of examples.

Capital required per employee

The real mark of industrial progress is the growth of investment per person employed in industry. The food industry shows as a whole very great differences in size of total capital required per person employed in the various branches. The technical level of equipment used is more or less interrelated with the number of persons employed. Simple production methods and reliance upon manual work demand a smaller requirement of capital per person employed. Although the capital required per employee in the Polish food industry averaged around 3,000 U.S. dollars, there exist great differences in this respect. For example, relatively large investments up to 8,000 dollars per person are needed in flour milling, edible oil and fruit-juice manufacture, distilleries, dairies, and breweries.

Some 2,000-4,000 dollars per person employed are required in bakeries, yeast production, meat establishments, and sugar manufacture. Still smaller capital is required in fruit and vegetable canneries, ice-cream and vinegar manufacturing, as well as in small bakeries and small fresh meat and sausage establishments.

The above data reflect average Central European conditions which prevailed until a few years ago and still exist in many countries. It may be assumed that the capital required per employee is in some other countries 50-150% larger.

As regards current requirements of capital per person employed the diversification is also very considerable, being small in vinegar, starch, bread, fresh meat and meat products manufacture and cold storage warehouses, medium in dairies, edible oil, meat canneries, bacon factories, and distilleries, and large in fruit and vegetable canneries, sugar factories, and medium and large flour mills.

Conclusions

The data presented are general figures which give an opportunity of comparing ones own productivity of capital with that of a similar concern. These productivity data do not measure the specific contribution of labour or of capital or of any other factor of production, but show instead the joint effects of a large number of separate, though interrelated influences, such as technological improvements, the rate of operation and size of plant, the flow of material and components as well as the skill and effort of the work force, the efficiency of management and distribution. Thus the fact should be recognised that the productivity of capital affects not only its own business, but its industry and its country as well.

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Meat Animals

A book recently published in a students' edition* does much to bridge the gap between veterinary text books and the more elementary books available on the structure of meat animals. After a chapter on the general biology of animal tissues, the book deals systematically with bones, skin and membranes, the nervous, vascular digestive, respiratory, and urino-genital systems, and the processes of reproduction. It also contains a chapter on the fowl.

* *The Structure of the Meat Animals*. By Roderick Macgregor. Students' Ed. 1957. Technical Press. Pp. 238+vii. Illus. 12s. 6d. net.

Water Treatment in Food Factories

A "FOOD MANUFACTURE" SURVEY

An abundant supply of suitable water is a prime requisite for every food factory. In many cases, a satisfactory supply is available from municipal or other sources. Often, however, water must be drawn from a private supply and treated on the factory site. This article gives an account of the three principal ways in which water may have to be treated before use.

IN most areas of Great Britain sufficient mains water is available from municipal or commercial sources of supply to fulfil the primary needs of food factories. It is unusual, such is the high standard of this water, for it to need any further treatment once it has entered the mains supply, save for a measure of softening in some areas. For some processes, however—as for instance where large amounts of fluming water are used—it may be more economical to draw on secondary sources of water; and in many countries other than Great Britain the whole of the water used may have to be taken from private supplies and treated accordingly.

Where this is the case, the steps which may be necessary are essentially:

(*i*) Clarification.
(*ii*) Chemical sterilisation.
(*iii*) Demineralisation.

The last-named step is intended to cover all processes by which undesirable minerals are removed, although in many cases the total mineral content of the water is not reduced.

Clarification

The methods employed for clarification depend to some extent on the maximum amount of sediment likely to be found in the water. When water is drawn from underground sources, filtration alone may be sufficient to remove the slight amount of turbidity occurring during periods of heavy rainfall. When the water is drawn from rivers or other foci of surface drainage, however, periods may occur during which a very heavy turbidity, sometimes amounting to actual muddiness, occurs. In such cases, the operative life of a filter fine enough to remove the sediment would be too short to be practical, and a process of flocculation and sedimentation must be resorted to. Sedimentation is usually carried out in a large tank or a series of tanks, so designed that the water flows through with a minimum of turbulence, and so baffled that direct flow of the water between the inlet and outlet points is prevented. A coagulant such as ammonium sulphate or iron alum is added to the water near the point of inlet to flocculate the suspended matter and increase its rate of sedimentation. Lime may also be added in cases where the carbonate content of the water is insufficient to precipitate the aluminium hydrate formed by this addition. Under the influence of this coagulent, which is commonly added at a level of about one grain per gal., the suspended matter settles out during the passage of the water over and around the baffle walls. Clear water can then be drawn off from the top of the tank, whilst the accumulated sediment may be cleared from the bottom periodically.

Although such a sedimentation process does not involve the use of any elaborate equipment, it is obvious that the water must remain in the tank for a certain minimum period for efficient sedimentation to occur. Where the demand for water is heavy, therefore, the very size of the tanks necessary may make the process initially expensive. This has to some extent been overcome in the modern *Candy* vertical flow system, in which sedimentation is accomplished with a relatively short holding time.

Filtration

When gross sediment has been removed by sedimentation, or where conditions render sedimentation unnecessary, the next stage in clarification is usually filtration. In large-scale water undertakings, much use has been made of gravity filtration. In this process, water is allowed to percolate slowly through sand beds, usually under a head of only about 3 ft. Once again a large area must be used if the demand for water is at all high, and for factory use the pressure sand filter is much more commonly employed. A mechanical filter will often deal with as much as 100 gal. water per sq. ft. per hr., as opposed to the low rate of 2 to 3 gal. per sq. ft. per hr. which may be necessary to obtain good bacteriological quality when a gravity filter is used.

In general, filters of this type are equipped with a sand bed, which is laid down before the filters are brought into use, and which remains in position more or less permanently. The filters are cleaned by means of compressed air and a water flush-back, but the formation of a layer of biological material on their surface considerably aids their functioning, as is the case with gravity sand filters. It is clear, therefore, that if clogging of the filters occurs too frequently, and flushing has to be performed too frequently, the layer of biological material will never get time to consolidate, and the filter will never work really efficiently. It is therefore essential, where the amount of sediment carried by the water is really high, that some form of pre-treatment, such as that described above, be employed.

When mechanical filters of this nature are employed it is often the practice to install at least one more filter than is called for by the demand of the factory for water, so that routine cleaning of the filters, and the re-laying of sand beds on

Permutit vertical pressure filters, with trenched mains.

the rare occasions that this is necessary, interferes as little as possible with the factory operations. This practice is entirely to be recommended, for nothing can be more disastrous in the operation of a food factory than a sudden inadequacy in the water supplies.

For most purposes, the clarity of water leaving a good sand filter is entirely adequate. For certain specialised purposes, however, such as the production of bottled drinks, water with an extra degree of sparkle is required, and the incoming factory water is therefore put through a "polisher." This usually consists of a filter containing diatomaceous earth, supported on screens of non-corrosive material such as stainless steel or phosphor bronze. The filters are first primed with the earth, the emergent water being recirculated until such time as it is crystal clear. From then on, additional earth is added as a slurry with a small amount of the ingoing water, so that the filter bed is kept perpetually open in structure. When the screens become fully loaded with deposited material and spent earth, they are flushed clear by a back-flush system, the whole cycle then being repeated.

This process gives a very rapid rate of filtration, and it is becoming increasingly popular not only as an adjunct to sand filtration, but in many cases as an alternative to it. The fact that the filter bed is frequently changed, and does not in any way depend on the formation of a layer of organic growth, has an obvious appeal to the bacteriologist, and the rapidity with which filtration occurs enables relatively small-sized equipment to be employed for a given capacity required. The operating expenses are somewhat higher than those of sand filtration, as a constant usage of diatomaceous earth is involved, but the expense is still by no means prohibitive.

Chemical sterilisation of water

The efficient filtration of water may reduce its bacterial content by upwards of 90%, and where water is of good initial bacterial quality this may constitute all the treatment necessary. Where the initial quality is poor, however, it may be necessary to resort to further measures of purification. Moreover, the water may be of such clarity as to render filtration completely superfluous, and still be highly suspect from a bacteriological point of view. In such cases it is usual to resort to chemical sterilisation.

The most common chemical used in the sterilisation of water is chlorine. This may be added in the form of dissolved chlorine gas, or as a solution of sodium or calcium hypochlorite. It is necessary to employ some form of proportioning device, if the chlorination is to be carried out at all efficiently, and several of these are now available on the market. The use of hypochlorite solutions is now tending to be replaced by the use of gaseous chlorine, as such solutions are rather unstable and may give rise by their decomposition to errors in the amount of chlorine being added to the water.

When small amounts of chlorine are added to water from natural sources, they immediately disappear, being used up in reactions with the organic matter in the water. It is therefore necessary to satisfy this demand for chlorine before free chlorine can be made available in the water for sterilisation purposes. The actual amount of residual chlorine required depends on the time of exposure of the water to the chlorine before use, and the purpose for which the water is required. A residual chlorine content of 0·5 p.p.m. with a contact time of 15 min. seems quite sufficient to account for all bacteria of pathological significance, but this concentra-

tion will not necessarily account for all food spoilage organisms. In canning plants, where the heat process given to the food after canning is the sole means of preservation, it is particularly important that the water used for cooling the cans after this heat-processing should be as free as possible from spoilage organisms. It has been shown that during the cooling period the seams of cans may open to some extent, allowing small amounts of the cooling water to enter the can. If this cooling water contains viable spoilage organisms, it is clear that subsequent spoilage is bound to occur. It is therefore customary in canning plants to chlorinate the can cooling water to a level of about 2 p.p.m. of residual chlorine, and if the cooling water is recirculated this figure may well be doubled.

It is not considered that these levels of chlorine have an appreciable effect on the corrosive action of the water. They are high enough, however, to have a marked effect upon its taste. Where it is desired to chlorinate water at these levels, therefore, and some of the water will subsequently be used for drinking, it is necessary to destroy the chlorine after its sterilising action is completed. This is usually done with sulphur dioxide or active carbon.

Superchlorination of this kind, followed by dechlorination, is often highly effective in removing tastes due to bacterial or algal action in the water. It may also be used to assist in the removal of iron and manganese from water.

The point of application of the chlorine varies with the general design of the water supply system. Since organic matter takes up chlorine, it is obviously more economical from the point of view of chlorine usage to chlorinate after filtration. On the other hand, chlorine added before filtration is extremely useful in keeping filters free from the growth of algæ, and thus prolonging the time necessary between cleanings. It is therefore the practice in some undertakings to split the dose, a part of the chlorine being added before filtration and the rest after.

The chloramines, which are formed by the reaction of chlorine and ammonia, are now finding increasing use as sterilising agents in place of chlorine. They are more stable than chlorine in dilute solution, and consequently retain their germicidal action over much longer periods. They are also much more powerful germicides, compared at equivalent chlorine content, though their activity is subject to a definite time-lag. They do not give rise to the unpleasant off-tastes sometimes associated with the use of chlorine. These tastes are frequently associated with the presence of phenolic bodies in the water, and in these cases the addition of ammonia to the water prior to the addition of chlorine is highly beneficial.

Several other methods of sterilisation, including the addition of ozone, the use of ultra-violet rays, and the addition of minute quantities of silver (the *Catadyn* process), have been used at various times, but in general the popularity of chlorine in one form or another has been overwhelming for sterilisation of water for food factories.

Water softening

The value of removing excessive hardness from boiler feed water is well known, and need not be stressed at this point. Perhaps less well appreciated is the fact that water containing a high proportion of minerals is undesirable in food factories for several other reasons. For instance, the presence of calcium and magnesium salts may render water unsuitable for the treatment of fruit and vegetables. These elements are capable of combining with pectic materials in plant tissue, with the formation of insoluble pectates, and material brined or otherwise treated with hard water is very liable to become coated with a tough outer skin. Another disadvantage of hard water, particularly where bicarbonate hardness is concerned, is its tendency to throw down a precipitate on boiling. This is unsightly in many products, and can be a great nuisance generally within the factory. It is therefore advisable for most undertakings to adopt some measure of water softening when the total hardness of the water available is much in excess of 100 p.p.m.

The two systems of water softening most generally used are the lime-soda method and the base-exchange method. In the former, sufficient lime (calcium hydroxide) is added to the water to precipitate the dissolved calcium bicarbonate as insoluble calcium carbonate, and the magnesium salts as magnesium hydroxide. At the same time, sodium carbonate (soda ash) is added to convert the calcium sulphate to calcium carbonate. Sodium aluminate may also be added to assist the separation of the insoluble calcium and magnesium salts, and to remove any dissolved silicates, with which it forms insoluble double salts.

The base-exchange water softener operates by ion exchange. When water containing dissolved calcium and magnesium salts is brought into contact with the base-exchange material, the calcium and magnesium ions enter into combination with the material, displacing an equivalent number of sodium ions. There is therefore no reduction in the total soluble solids content of the water, but the dissolved sodium salts resulting from the reaction do not have the undesirable characteristics of the calcium and magnesium salts which they replace.

If for any reason it is desired to carry the demineralisation process further, there is available the Permutit *Deminrolit* process, by which the dissolved salts can be removed almost entirely to give what is virtually equivalent to distilled water. There are few cases in the food industry, however, where it is necessary to go to such lengths.

Considerable trouble can also be caused to food manufacturers by the presence of iron in factory water. This substance is particularly prone to give rise to discoloration problems. It reacts with sulphur compounds, produced by the effects of heat on food proteins, to give black iron sulphides, and

(*Concluded on page 558*)

EQUIPMENT FOR WATER TREATMENT

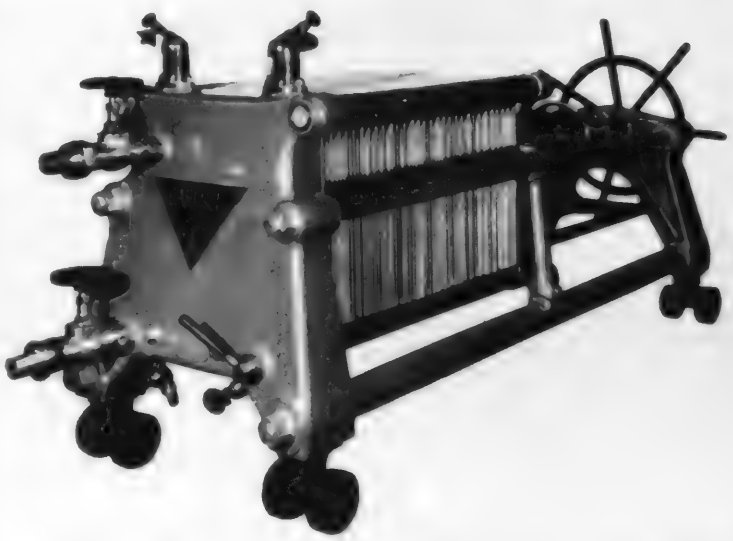
Water Clarification

A WIDE variety of water clarification equipment is made by the Permutit Co., Ltd. This includes equipment for the addition of coagulating agents such as aluminium sulphate, which may be used either in solution or as a dry powder. The dosing gear can be designed to give either constant or proportional application of the chemical.

Sedimentation tanks to suit a variety of conditions are also made by the same firm. In their horizontal flow tanks, a perforated partition is substituted for the more conventional "under and over" baffles, and these are claimed to give a uniform flow of water throughout the cross-sectional area of the tanks. Sludge withdrawal is effected through perforated pipes laid in sludge collecting valleys, each discharge pipe being provided with its own valve. Where the character of the water renders mechanical flocculation desirable, the flocculation chamber can be arranged as an integral part of the sedimentation tank, concrete work thereby being reduced.

Under suitable conditions, clarification can be effected in vertical flow tanks. In these the alum-dosed water rises upwards through a suspended sludge blanket at a steadily decreasing velocity. Intimate contact with pre-formed floc particles is thereby established, and efficient clarification results. The Permutit *Precipitator* is a sludge remover of rather different design but working on a similar sludge blanket principle.

Permutit also construct gravity filters and manufacture pressure sand filters. The gravity filters may be of reinforced concrete, masonry or steel construction. They contain horizontal layers of sand and gravel in graded sizes, the coarsest layer being at the bottom and the finest at the top. The total filter area required is usually divided into a number of individual units, each provided with its own control valves. Control may be manual, semi-automatic or fully automatic.



A Carlson Zenith sheet filter. The illustration shows the 60 cm. size. These filters can be used for the clarification of water and other liquids by filtration through various grades of filter sheets.

The pressure filter is essentially similar, with the important difference that the filter bed is housed in a closed cylindrical steel vessel of either vertical or horizontal design, filtration taking place under pressure.

To ensure efficient cleaning and long runs between cleaning periods, a special system of air distribution is fitted to the filters, which is said to ensure an even and thorough scouring of the filter bed during the back-flush cleaning operation.

Diatomaceous Earth Filtration

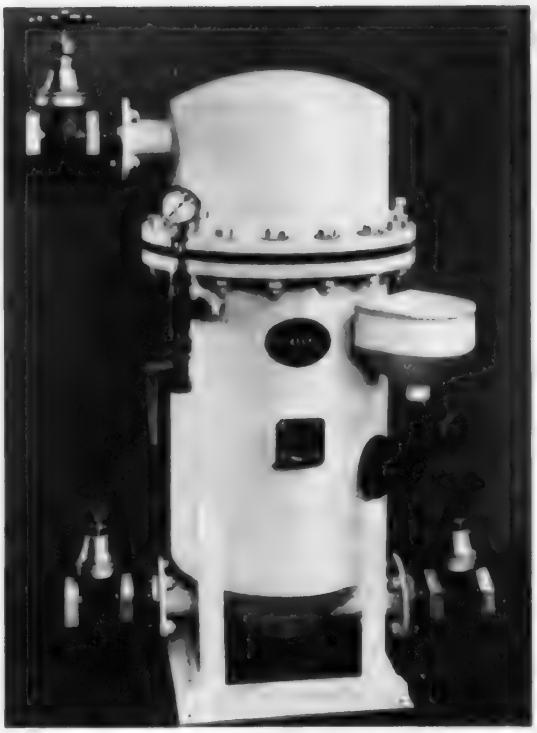
Diatomaceous earth filters for water and other liquids are made by the Paterson Engineering Co., Ltd. Their *Stellar* filter comprises a number of wire wound elements suspended from a diaphragm plate which is contained in a cylindrical shell. The filtering element consists of a fluted former accurately machined with a screw thread the whole length, forming a precise and accurate key by which the wire winding is located. The special *Stellafilt* powder (diatomaceous earth) is deposited evenly and thinly on these elements producing an ultra fine filter bed which can be dislodged and reformed a number of times until it is too dirty for further use. This type of filter is said to offer the advantages of low capital cost, small area, economy in housing, high filter rating, ease of operation and adaptability. *Stellar* filters are also used successfully for wines, spirits, cider, soft drinks, vinegar, fruit juices, essences and syrups in the sugar industry and for groundnut and other edible oils. As well as producing a highly polished liquid, these filters greatly improve the bacteriological quality of the liquid filtered.

Sheet Filters

Sheet filters also find many applications in the food industry, including the treatment of process water. A number of filters of this type are made by John C. Carlson, Ltd. They are suitable for use with filter sheets of various porosities, depending on the nature of the solid materials to be removed. The sheets themselves are fabricated of cellulose and asbestos, and the finer grades are said to remove all micro-organisms from the filtered water, leaving it in a sterile condition. Coarser grades are available for more rapid filtration where simple clarification is desired.

The Carlson *Zenith* filters, the largest of the range, are available in 40 cm. and 60 cm. sizes, which work at an operating pressure of 45 lbs. p.s.i.; strengthened models, suitable for operation at pressures up to 120 lb. p.s.i., are also available. The filters can be so constructed that the water is "roughed out" through diatomaceous earth in one section and polished and sterilised through fine sheets in another.

Where only small amounts of filtered water are required, the *Pilot-Princess* and the *Ariston-Princess* are suitable.



Stellar diatomaceous earth filter, made by the Paterson Engineering Co. Ltd.

Centrifugal Clarification

Solid materials may also be removed from water by centrifugal separation. This is equally applicable to the removal of original turbidity, after treatment of the water with coagulating agents, and to the removal of precipitates thrown down during softening by the soda-line processes. The insoluble material which is produced by flocculation and precipitation is successfully separated from the water by the Sharples *Super D Canter*. This machine is a horizontal bowl centrifuge rotating at speeds to give separating forces of upwards of 2,000 g. A scroll rotating at a slight differential speed continuously removes the sedimented material salts from the system at high rates of flow.

This machine can also be used for treatment of those waste waters associated with food factories, where insoluble material has to be removed before disposal.

Where higher separating forces are necessary the Sharples *DH* or *DV* range of centrifuges can be employed. Both of these centrifuges reply on a disc stack to improve separating efficiency, and the discharged sediment exits through nozzles sited in the periphery of the bowl. In the DH *Nozljector* restriction of the nozzle size enables high concentrations of sludges to be produced.

The size of the nozzle necessary to obtain the degree of thickness required often places restrictions on the use of this type of centrifuge, as with effluents containing particles over a certain size nozzle blockage may occur. The Sharples DV range successfully overcomes this difficulty by being fitted with nozzles which are opened and closed by an external timing system. While coarser material can be handled in this fashion higher degrees of concentration can often be effected. Both these machines have been used successfully on the disposal of whisky wastes.

A number of centrifuges suitable for the separation of solids and liquids in this way are also included in the *De Laval* range, made by the Alfa Laval Co., Ltd. Their PX209.00S model incorporates a self-opening separator which discharges the accumulated sludge automatically, thus ensuring continuous operation.

Water Softening

Water softeners based on the ion-exchange system have been manufactured by Permutit for many years, and are now extremely well known. Their industrial range includes softeners with manual, semi-automatic, and fully automatic control. When the base-exchange material with which the softeners are charged is expended, it is regenerated by treatment with saturated brine. The manually operated units are provided with an assembly of globe or gate valves which are opened or closed in appropriate sequence at timed intervals during regeneration. Regeneration takes about 1 hr., and the plant is normally arranged for one or two regenerations daily.

In the semi-automatic softeners, control is effected through a single multiport valve, by which all the steps of regeneration are con-

Permutit type IDG base-exchange softener for treating small quantities of water.

trolled. The same type of valve is also fitted to the fully automatic models, the valve in this case being operated electrically. The length of the run is controlled by an electric contact-head meter placed in the soft water, or by an automatic hardness tester. When the predetermined amount of water has run, the meter or tester activates the motor operating the valve, setting in motion the regeneration process. Washing and brining are also controlled automatically, and the flow of water is restored when regeneration is complete.

Ion-exchange water softeners are also made by the Paterson Engineering Co., Ltd. For normal softening a base exchange resin is used, but water equalling distilled quality is provided in their *Solobed* softener, which consists of a single cylinder containing both anionic and cationic exchange materials.

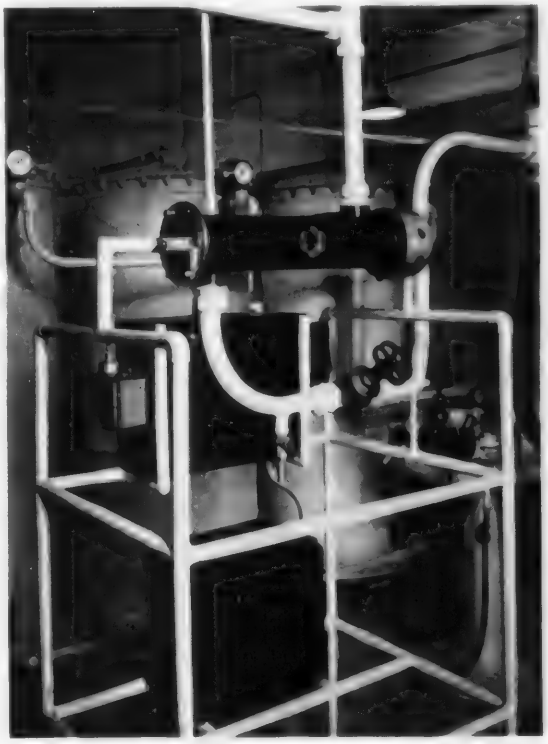
Lime-soda softening can be carried out in the *Accelator* equipment made by the same company.

Sterilisation

Chlorinators for water sterilisation are made by the Paterson Engineering Co., Ltd., and may be used in conjunction with their *Stellar* filters. The *Chlorocel* unit operates by passing a low-voltage current between graphite electrodes immersed in weak brine. The sodium hypochlorite solution formed is added to the water in metered amounts to give a level of free chlorine sufficient for sterilisation purposes. For heavier loads and larger installations, Paterson's recommend the use of their *Chloronome* equipment.

Equipment for the sterilisation of water by ultra-violet irradiation is manufactured by Hanovia, a division of Engelhard Industries, Ltd. Their fully automatic model can handle from 50 to 2,500 gal. of water per hr. If either the electrical supply or the water flow is interrupted, the other is automatically shut off. Water is also cut off if the mains voltage falls by more than 12%, so that periods of inefficient operation cannot occur. The sterilising unit consists of a horizontal copper cylinder, surrounding a smaller quartz cylinder which contains the arc tube. Water enters the annular space between the two cylinders, where it is sterilised by exposure to the ultra-violet radiation. A manually controlled model of similar design is also available.

Hanovia say that sterilisation by this method is more expensive than chlorination, but point to the obvious advantage that overdosing is impossible, and that treated water is entirely free from acquired tastes. The estimated cost of sterilising water is about 2·5d. per 1,000 gal.



An ultra-violet water sterilisation unit made by Hanovia, in the brewery of Cantrell and Cochrane Ltd., Belfast.

The new Compound water meter made by George Kent Ltd.

Water Meters

For many purposes it is necessary to have an accurate knowledge of the amount of water flowing in a given time, and a new meter has recently been developed by George Kent, Ltd. Their *Compound* meter is extremely versatile, as it combines a low-rate semi-positive rotary-piston meter with a high rate inferential meter. Water flows through one or the other according to the pressure, and the change from one to the other as the rate of flow rises or falls is entirely automatic. The unit is extremely compact, and contains no external tubes.

The meter begins to register at a flow of 3 gal. per hr., and is accurate to within 2% down to 24 gal. per hr. Maximum registration is 10 million gal. per hr.

Porous Ceramic Diffusers

Porous ceramic diffusers provide a satisfactory and economic means of injecting air or gas into a liquid and of ensuring good gas distribution in a technique which is now well-established in the treatment of industrial liquors and, in particular, of water or aqueous effluents. Simple aeration, using porous ceramics, is effective in the control of B.O.D., in removing unwanted entrained or dissolved gases, in precipitating certain chemicals (particularly compounds of iron) and in dispelling objectionable tastes or smells. Chlorination with gaseous chlorine introduced through porous ceramic diffusers is well established as a means of sterilisation, whilst the same diffusers may subsequently be employed to inject sulphur dioxide and neutralise any excess of chlorine. In like manner, ozone may be employed, an approach not yet widely adopted in this country.

A wide variety of porous ceramic diffusers is made by Doulton and Co., Ltd., who suggest that in general it is better to employ cylindrical porous ceramic elements, rather than the flat tile form, for diffusion purposes. The tubes are mounted on suitable stoneware, metal or plastic fittings for connection to the gas supply, and ranging upwards from thimble size to lengths of about 4 ft. 6 in., and diameters of 6 in. or more.

These same tubes are equally effective as filters, either in their own right or in conjunction with filter cloths and filter aids. They are available in a range of sizes, handling quantities of water (or other liquids) from a few gal. to several thousand gal. per hr. Such units are invaluable for the final polishing of water immediately prior to use, removing rust and pipe-scale from mains water, or sand and other impurities from well and bore-hole water.

In tile form, porous ceramics may be used with advantage as supports for sand bed filters, which may be either the open (gravity) type or closed (pressure) pattern.

Water Treatment in Food Factories

(*Concluded from page 554*)

forms dark complexes with the tannins which occur in many foods of vegetable origin. Where the water is softened by one of the processes described above, iron will also be removed, but if the water is naturally too soft to render these techniques necessary, special steps may have to be taken to effect the removal of iron, if the content of this element exceeds about 2 p.p.m. In such cases it is possible to remove the iron by treating the water with lime, and in some instances adequate aeration of the water, followed by filtration or a period of settling, is all that is required. Iron is sometimes found in water in organic combination, in which case pretreatment of the water with chlorine, which oxidises and destroys the organic matter, is helpful in effecting clarification.

Surface Active Agents and Milk Fat

OBSERVATIONS on the effect of a number of surface active substances on the fat on the surface of milk are reported* by the Dairy Research Section, C.S.I.R.O., Melbourne, Australia.

A microscopic study showed that surface-active substances applied to the surface of whole milk may either bring fat, globules, clumps, lenses and patches to this surface, or sweep the surface clean of these fat forms.

Methyl and ethyl alcohols showed a moderate rising action whereas homologues from *n*-propyl alcohol to *n*-decyl alcohol were strongly active. There was only a slight difference in the activity of primary, secondary and tertiary butyl alcohols.

Glycerol was almost inactive, but monobutyrin was strongly active in bringing the fat globules to the surface while tributyrin swept the surface clean.

Spans and *Tweens*, sorbitan and polyoxyethylene sorbitan esters of higher fatty acids also swept the milk surface clean.

* N. King. *J. Dairy Res.*, 1957, **24**, 1, 43.

Radiation Processing of Foods—2

A Commentary on Present Research

By R. S. Hannan,* M.A., Ph.D., and Margaret J. Thornley,* B.Sc., Ph.D.

In the second part of this article, the authors examine the possible uses of ionising radiations in the pasteurisation of several types of foodstuff, and discuss some of the projects which are as yet only in the research stage.

PROCESSES OF MODERATE PROMISE

"Pasteurisation"

The processes discussed so far have been limited in their scope and commercial value. Prevention or delay of microbial spoilage on the other hand would be of major interest to the food industry as a whole, and research activity is mainly directed towards this end.

Most promising is the possibility of simply inactivating a fairly high proportion of the micro-organisms initially present. Inactivation of even 99·9% of these organisms, for example, would usually extend appreciably the time required for the population to increase to the spoilage level — normally about 10^7-10^8 organisms/g. for bacterial spoilage. It should be noted that a given dose will, in general, inactivate a given proportion of the organisms, irrespective of the number present, so that the initial numbers must obviously be kept as low as possible to obtain a useful advantage from so-called "pasteurisation" treatments. Hygienic handling would consequently be essential.

The doses which have been suggested range from 50,000 rads to 1,000,000 rads. Three broad types of process can be recognised:

(1) The low end of the scale would only be useful in special cases where few organisms were initially present.

(2) Moderate doses in the region of 100,000 rads may be effective where the chief spoilage organism is the radiation sensitive *Pseudomonas*, as in surface spoilage of fresh meat.

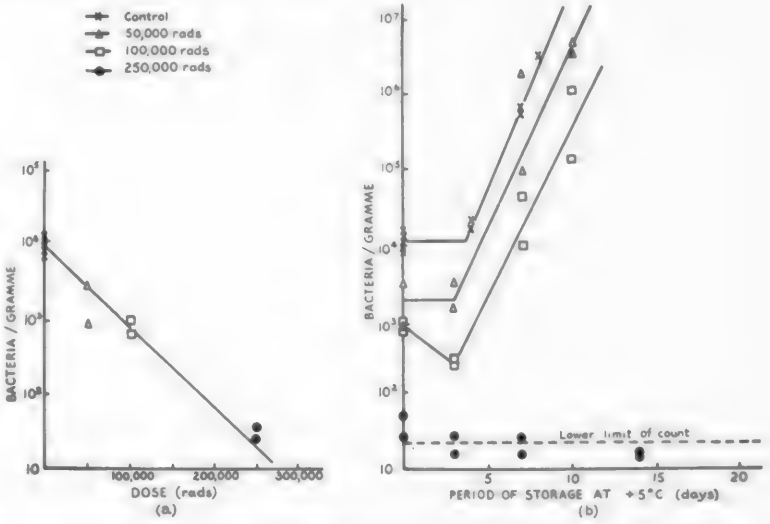


Fig. 4. "Pasteurisation" of minced chicken meat with 3 MeV cathode rays.
(a) Reduction of the numbers of viable bacteria with increasing doses.
(b) Subsequent increase in numbers during cool storage.
The meat was irradiated in flat aluminium cans 2·5 in. dia. × 0·4 in. deep and was in an anaerobic condition during irradiation and storage.

(3) 250,000 to 1,000,000 rads inactivate most vegetative micro-organisms and give a prolonged storage life to many products, particularly at refrigerator temperature.

An important feature of these processes is that even the highest doses quoted do not inactivate bacterial spores and certain *Micrococci*; the treated products must, therefore, be handled with care.

Again, each product and each variant of the irradiation treatment must be considered separately. The micro-organisms tend to be protected by some environments, particularly if active reducing agents are present or if the system is frozen or dried. Even the removal of oxygen has a protective effect. These same influences, however, often mitigate the irradiation damage. In our experience, for example, irradiation of lean meat in the frozen state produces only about a third or quarter of the odours and flavours produced in unfrozen material. Removal of oxygen also markedly reduces the odour and flavour production in fatty products, but, contrary to most belief, it has recently been shown in our laboratory that the odour of irradiated lean meat, and probably also the flavour, are more intense with irradiation in nitrogen than in oxygen.

The complexity of this total picture will need no emphasis. The position can best be outlined by considering a few examples.

Chicken

Typical results obtained in our

* Low Temperature Research Station in Biochemistry and Biophysics, University of Cambridge and Department of Scientific and Industrial Research.

work with minced chicken meat, irradiated and stored under anaerobic conditions, are shown in Fig. 4.[18] They indicate that a dose of 250,000 rads gives a very useful increase in storage life at refrigerator temperature. The initial numbers of viable organisms present were reduced by a factor of about 1,000, and the samples could be stored for at least 21 days without spoilage compared with a little over a week for the control; some of the samples even kept as long as 80 days. Flavour change at this dose level was barely detected by our taste panels,[2] but the raw meat had a characteristic odour and pinkish, transparent appearance which would be disadvantageous by present commercial standards. The results, however, were felt to be sufficiently encouraging to justify further investigation with whole eviscerated chickens, irradiated and stored under typical partially aerobic commercial conditions (*i.e.* in polythene bags). This experiment is still not completed, but the keeping qualities under refrigeration appear to be broadly similar to those with the minced chicken while the change in odours and appearance of the whole chicken are less marked.

Other meats

Other meats and fish behave more or less similarly to chicken. The odours and flavours are usually reported as being more intense with beef and less intense with pork, but their general character is similar for most muscle tissue. The volatile substances formed by irradiation include various sulphur-containing and carbonyl compounds.

Beef has received more attention than any other meat, particularly in the U.S.A.,[19, 20] and a dose of 100,000 rads has been found to increase the storage life under refrigeration between two- and five-fold. This is at, or slightly below, the threshold for detection of flavour change, but it should be noted that such meat, when raw, has a slight "irradiation" odour and often a wetter, more transparent, appearance than fresh meat.

The most recent development has been to combine low doses of radiation with antibiotic treatment of the meat.[21] Together these have been found by the American Meat Institute Foundation to inhibit bacterial development so much that the meat finally spoils through the action of yeasts, which are relatively resistant to both these agents. Work has even been carried out on controlling the yeasts by adding sorbic acid, and the meat has then been found to spoil eventually through "drip loss" and enzyme action.

Processed meats

With some processed meats there is more promise for avoiding loss of quality at "pasteurising" dose levels than with raw meats. Typical results are quoted by Proctor and colleagues.[22] In our own laboratory six batches of pork sausages purchased from different commercial sources were recently examined after receiving doses of up to 2,000,000 rads. Only in two cases was our taste panel able to distinguish the irradiated from the unirradiated. Bacon also develops less flavour change than raw pork, but here we have found that typical British bacon showed a distinct loss of quality even at 250,000 rads; the lean meat had an "irradiation" odour and flavour and the fatty tissue was "tallowy."

One factor which may have contributed to the favourable results with sausages was the presence of added sulphite, which can act as a "protective compound." Nitrite in cured meats may also act in a similar manner, and this and other reducing agents, including ascorbic acid, have been added, with a limited degree of success, to various foods before irradiation.[22, 23] There is corresponding scope for compounding recipes for new or modified processed foods capable of withstanding irradiation.

A particularly useful application would be for treating prepackaged sliced foods, especially since highly penetrating radiation would not be required.

Vegetables and fruit

The incidence of spoilage of various fruits and vegetables has been decreased markedly by irradiation with moderate doses,[24] but a useful commercial effect usually calls for doses which affect the texture of the product, even in some cases, to the extent of increasing the sensitivity of the tissue to microbial invasion. Products such as lettuce, where the texture is an all-important property, suffer a marked loss of quality, but peaches, for example, have been reported as reacting well. Flavour change is less of a problem with many of the plant products than with meats.[25]

Other products

Space does not permit a complete review of all the products which have been treated. In many cases a useful increase in storage life has been gained, but this has often been at the expense of quality and the commercial significance of the processes remains to be established.

Milk and other dairy products are examples of products which usually respond poorly to irradiation, developing strong tallowy flavours, but work at the Massachusetts Institute of Technology has shown recently that the flavours can be controlled by evaporation under vacuum during irradiation.[26]

It can be seen, therefore, that there are limited indications of success in applying "pasteurisation" treatments to a variety of products, and that various possibilities of decreasing the irradiation damage or increasing the sensitivity of the micro-organisms have still to be investigated fully. But a note of warning must be sounded about such processes in general. The micro-organisms which survive treatment with substerilising doses may include pathogens and, since competition from normal spoilage organisms will have been removed, they may find conditions more favourable for their development. Until much more information has been obtained regarding the nature of the spoilage of foods treated in this way, it is *essential* to think in terms of storing them under refrigeration whenever the product may

contain and support the growth of pathogens.

APPLICATIONS STILL IN A RESEARCH PHASE

Sterilisation

Doses of 2 to 3 million rads are required for the inactivation of all the micro-organisms in small laboratory samples, and even higher doses would be required to reduce the possibility of survival of *Clostridium botulinum* to an acceptable commercial level. Present indications are that this is likely to require some 5,000,000 rads, and at dose levels of this order of magnitude most foods which we have examined have suffered a marked loss of quality. Extensive work in the United States[5, 6, 25] has shown that such products may be rated by taste panels as "acceptable," but their commercial value, in our view, is doubtful. The effects on quality can be lessened by various procedures such as irradiating in the frozen state, controlling the oxygen content and adding protective compounds,[27] while post-irradiation storage at room temperature also decreases the odours. Research on these procedures is still continuing, but there has been little significant advance in recent years in methods which would be commercially applicable to products such as raw meat. The raw products are, moreover, not stable on long storage even at moderate room temperatures.[28]

The probable trend of future work will be to seek methods of combining irradiation with other methods of processing such that each contributes a substantial degree of kill. Particularly interesting is the combination with heat processing. Kempe[29] has followed up earlier findings of Morgan and Reed[30] and found that spore forming bacteria become more sensitive to heat treatment after they have been irradiated. This opens up, for example, possibilities of a canning procedure combining a reduced irradiation treatment of about 1,000,000 rads with a reduced heat treatment. However, tests carried out in our laboratory with beef stews, with and without various additives, have so far given little, if any, improvements over conventionally canned products, and much research on these processes is clearly necessary.

Table 2. Summary of methods of radiation processing investigated

1. Destruction of organisms which cause food spoilage.	
(*a*) Micro-organisms	50,000-5,000,000 rads.
(*b*) Insects	10,000-100,000 rads.
2. Destruction of harmful organisms in foods.	
(*a*) Micro-organisms	300,000-1,000,000 rads.
(*b*) Helminthic parasites	up to 25,000 rads.
3. Control of specific biological activity of foods.	
(*a*) Preventing sprouting	up to 10,000 rads.
(*b*) Delaying ripening of fruits	Experimental only.
4. Modification of specific properties of foods.	
(*a*) Flavour	Experimental only.
(*b*) Colour	,, ,,
5. Ancillary uses:	
e.g. Sterilising packaging materials	Probably up to 5,000,000 rads.

Inhibition of sprouting of potatoes

At the other end of the scale of doses is the possibility of preventing the sprouting of potatoes, onions, etc., with doses of about 10,000 rads.[31, 32] Apart from economic limitations there is a possibility that irradiated potato tubers will be more sensitive to rotting in storage and, under desiccating conditions, will lose water more rapidly than the controls.[33] Alternative procedures, therefore, may prove to be commercially more competitive.

Health considerations

The question whether irradiated food can safely be eaten could be the subject of a paper in itself, but the position can be summarised quite briefly.

In the first place it must be emphasised that the consumption of correctly processed irradiated food would involve no risk from *radioactivity*. The problem rather is whether the *chemical* changes produced by irradiation are innocuous.[34]

Exhaustive feeding tests with irradiated foods and other related studies have now been in progress in the U.S.A. over a period of several years. Some vitamin destruction has been observed, but toxicity as such has not appeared in many tests with thousands of experimental animals, including mice, rats, dogs, chickens and humans.[35] Further tests are still required, but it is already apparent that, from the point of view of production of toxic compounds, the irradiation process has not been faulted by a series of remarkably intensive investigations.

Cost of irradiation

Most estimates put the cost of delivering a dose of 2,000,000 rads in the range of ½d. to 6d. per pound of treated material, the higher figures relating to equipments which are now commercially available used for 8 hours a day and the lower figures to future equipments working for 16 hours a day.

Much of this cost represents amortisation of initial capital expenses, which are large compared with those of normal food processing equipment. Even a modest electron generator, complete with protective shielding and ancillary equipment, would cost £40,000 to £50,000, and an equivalent source of Cæsium 137 would probably be even more expensive. The need for skilled operators and appropriate safety precautions is also a further major charge.

It can be seen, therefore, that doses in the sterilising range are at a level where they would be attractive only for highly priced products. For "pasteurising" doses of about 250,000 rads, however, the cost of processing becomes a fraction of a penny per pound and

would probably be acceptable for many products, provided that the process offered a clear technological advantage. At the level of tens of thousands of rads the cost of handling the product becomes a dominant factor and the actual cost of irradiation would be small provided that the installation was not reduced in size to such an extent that the unavoidable minimum costs of labour, etc., were spread over a relatively limited production.

Activity in Britain

In conclusion, a few words about experimental work in Britain are appropriate. It is well known that considerable work is in progress in the United States of America and that this has progressed to the stage of constructing an irradiation unit capable of treating large quantities of food. It is, however, less well appreciated that work has also been in progress in Britain for several years. Work in our own laboratory goes back, in fact, to classic pre-war studies on the mechanism of the radiation inactivation of micro-organisms, and we now have a group of several workers investigating different aspects of the subject. Radiation facilities of various types, in our own and other laboratories, are in use. The Technological Irradiation Group of the Isotope Division of the Atomic Energy Research Establishment, Harwell, also has a number of workers engaged in various studies with foods, and extensive irradiation facilities have been constructed, as already seen in Fig. 2.

Further irradiation facilities are available at the laboratories of the manufacturers of electron accelerators and the types of equipment which would be required for industrial application are being developed.

The activities of these groups, together with those of other organisations which are co-operating with them on specialised studies, amounts to a not inconsiderable effort, and the volume of work can be expected to grow as the promise for application increases.

This paper has been prepared as part of the programme of the Food Investigation Organisation of the Department of Scientific and Industrial Research.

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▶Hints on serving food from collapsible tubes are given in a new booklet prepared for the Collapsible Tube Manufacturers' Association. There are now 40 different varieties of tubed food in Britain which are of foreign origin and the number of British manufacturers is also growing.

Olive Oil Processing

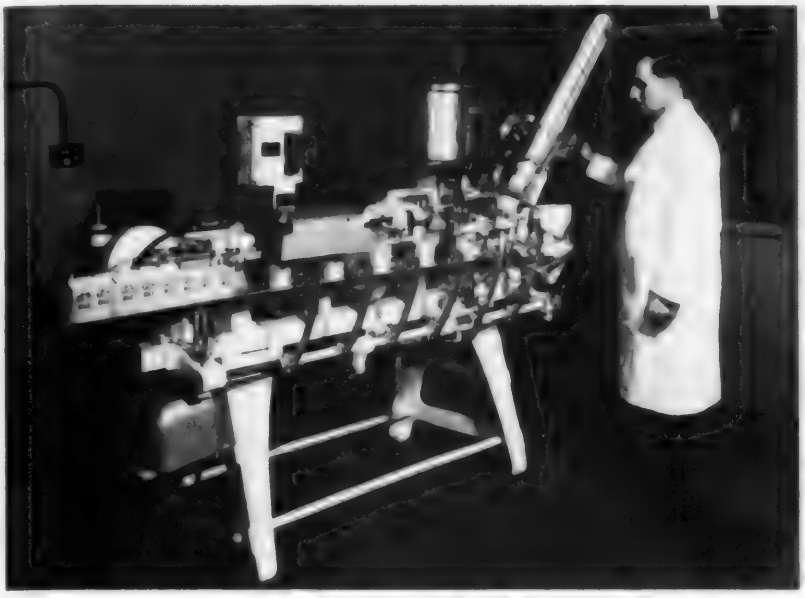
THE United Nations Organisation is devoted primarily to the cause of peace and international co-operation. It is perhaps appropriate, therefore, that one of its associate bodies, the Food and Agriculture Organisation, should turn from the somewhat frustrating pursuit of the olive branch to the more practical subject of the olive fruit. A recent publication* gives a remarkably comprehensive account of the olive oil producing industry as it is mainly constituted today. After dealing briefly with the olive tree and its fruits, the authors give a more detailed account of the composition of olive oil and its more important characteristics. Pre-processing operations such as harvesting, transporting, and cleaning the fruit are then discussed. In the main part of the book which then follows, a very full account is given of methods for crushing the fruit and extracting the oil, and of the machinery available for this purpose. Finally, the authors deal with the further treatment of the extracted oil, and give a short account of some of the recent trends in the industry.

For the very moderate price this well-illustrated booklet gives an adequate introduction to the industry. It should prove invaluable to people interested in embarking on the production of olive oil, and it provides interesting reading for anyone with a general interest in the technology of oil-bearing foods.

* *Olive Oil Processing in Rural Mills.* F.A.O. Agric. Development Paper No. 58, 1956. H.M.S.O., London. Pp. 103. Illus. 5s. net.

▶Visco Engineering Co., Ltd., have published a new brochure (No. 574) "Modern Dust Collection," which supersedes their previous publication No. 532 published in 1953. In the revised brochure the text has been rearranged and slightly modified; the section on fume removal has been omitted; several new illustrations and a description of a combined dust recovery and fume removal plant have been included; and tables of typical dimensions and capacities are given.

Dairy Machinery and Equipment on Show



Perga automatic carton filler and sealer, as exhibited at the Dairy Show.

THE Dairy Show naturally interests a large number of food manufacturers, especially when, as was the case this year a "machinery year" is held. This provides an opportunity for the display of machinery and equipment with far wider applications than in the dairy industry alone, and manufacturers frequently use it as a means of introducing to the trade their latest developments. Several new and interesting machines, covering a variety of operations, were on display this year.

Bottle washing and handling

A good example of equipment with many applications outside the dairy industry was provided by the bottle cleaning and handling machinery on display. One of the most prominent of the cleaning machines was British Miller Hydro's "400" bottle washer, which handles up to 550 bottles per min. In this machine, the bottles are subjected to nine processes: pre-rinse, pre-wash (at different temperatures), soaking, hot caustic friction washing, soaking, and rinsing (two stages). The bottles pass automatically from one stage to the next.

Examples of Dawson's washing equipment were also on view. These machines range in capacity from the *Apex*, which handles 600 bottles per hr. to the straight-line *New Hydro*, which has a capacity of 20,000 bottles per hr.

A particularly interesting exhibit in the field of bottle cleaning was U.D. Engineering Co.'s *Rototector*, one of the 41 new inventions exhibited and the winner of a silver medal and the Reserve Perpetual Challenge Trophy. The *Rototector* is an electronic eye which scans bottles after washing and automatically rejects any containing broken glass or foreign matter, which may be so small as to be virtually invisible to the unaided eye.

Crating and decrating machines, crate stackers and destackers, and crate washing machines were also exhibited by Dawson's and the U.D.E.C., Ltd. The latter company were awarded a second silver medal for their stacking machine, which can handle a wide range of crates at speeds of up to 22 per min. Stacks up to seven crates high can be assembled or broken down into separate units.

Filling equipment

A number of firms exhibited filling and capping machinery, and a filling machine captured a third award, this time a bronze medal, for U.D.E.C., Ltd. This was a 24-head pedestal-type, vacuum-operated machine with a capacity of 110 pint bottles per min. It has been designed to fill any still liquid into most sizes of narrow and wide necked bottles at filling depths varying between $\frac{1}{2}$ in. and $3\frac{7}{8}$ in.

Other interesting fillers on display included a range of *Albro* valveless, low-vacuum machines. Their S.308 and P.156 machines are geared for outputs of 1,000 gal. per hr. and 750 gal. per hr. respectively, the former machine being designed especially for the filling and capping of sterilised milk, whilst the latter is intended to deal with pasteurised milk. The *Albro* G.V.61 filler will be of

The Pneumatic cheese press exhibited by the Dairy Supply Co. Ltd.

particular interest to the small dairyman, as it can equally well handle pasteurised milk or fruit juices. It may be combined with the firm's latest aluminium capping unit to give outputs of up to 270 gal. per hr. The entire exterior finish of the *Albro* machines is of stainless steel, and polished stainless steel is used for all parts in contact with the liquid to be filled.

Geo. S. Clayton, Ltd., whose most notable development was a 12-head unit, now equipped with automatic lubrication to all static points, and Auto-Dairy Engineers, Ltd., also exhibited filling machines. The latter firm demonstrated a 12-head rotary machine with a filling rate of 2,400 bottles per hr. On the stand of Cockx and Sons (London), Ltd., pride of place was given to their type "R" 4-valve bottle filler, fitted with a conveyor feed and incorporating a Ford cap maker.

The UDEC Rototector scanner for detecting foreign matter and glass fragments in bottles.

Carton fillers

As well as the bottle filling equipment, several carton formers and fillers were also on display. These included equipment by Tetra Pak (London), Ltd., who also demonstrated their latest developments in the automatic crating and automatic vending of their now well-known cartons. An interesting machine of Canadian design, the *Perga* M automatic carton filler and sealer, was demonstrated on the stand of Perga Cartons, Ltd. The machine is equipped with a piston-type valve, and can handle milk, yoghourt, molasses or fruit juices with equal ease. The machine is said to require only one operator, and will operate at a capacity of 120 gal. per hr. on 8 oz. packs and 200 gal. per hr. on 1 pint packs.

Processing and liquid handling equipment

Several introductions of interest to processers of liquid foods in general were on display. Hiron and Rempler, Ltd., exhibited their *Rannie* homogenisers, which incorporate an oscillating, self-grinding homogenising head. Pipe sterilisers, plate heaters and coolers and batch pasteurisers were also featured by this firm. A variety of processing equipment was also exhibited by A.P.V., Ltd. Their plate evaporator (FOOD MANUFACTURE, November, pp. 522-3) still arouses obvious interest wherever it is demonstrated, and they also had on show a deodourising unit, developed originally in the U.S.A., where milk deodorisation is frequently necessary. In the field of fluids handling, they exhibited for the first time the W.A. wide-angle cock, which has been developed as an improvement of existing types.

The Talbot Stead Tube Co., Ltd., also exhibited a range of stainless steel pipes and accessories. These included their Cupford valve, believed by the firm to be the first 3-way diaphragm valve ever developed, and their *Metior* C.I.P. stainless steel fitting. This is a sanitary union claimed to have all the features necessary to allow "cleaning-in-place" techniques.

Cheese making

The renewed national interest in home-produced cheese which has grown since British cheesemakers have been able once again to put their best products on the market was well reflected by the interest shown in the English Country Cheese Council's stand. Here demonstrations were given of regional cheeses being sliced and wrapped by two new machines, the Flower cheese cutter and the Lerner Machine Co.'s Vacu-Seal heat sealing machine. Cheeses such as Double Gloucester, Cheddar, Cheshire, Lancashire, Wensleydale, Caerphilly, and Blue Stilton were on sale to the public, and proved extremely popular.

Machines and materials for cheesemaking were displayed by many manufacturers. One of the most noteworthy pieces of equipment on display was the Dairy Supply Co.'s pneumatic gang cheese press, which won a bronze medal in the new inventions section. This new press departs from the normal ram method of pressing, depending instead on special pneumatic equipment attached to the side of the press.

The pressure head and tail stop of the press are quickly detachable to allow slide-on loading or discharge at either end, which allows the press to be used in conjunction with a conveyor. Constant pressure of up to 3¼ tons can be obtained.

Advances in Food Technology

FAT-CONTAINING FOODS

Oxygen Test for Determining Shelf-life

A method for determining the shelf-life of fat-containing foods which is stated to be fast and more accurate than the present "Schaal oven" and "accelerated oxygen" methods has been devised at the Food Laboratories of Eastman Chemical Products, Inc.

In what is known as an oxygen bomb test, a weighed sample is placed in a bomb which is purged with oxygen, then charged with oxygen at 50 or 100 lb. p.s.i. The bomb is then placed in a 212°F. water bath. A recorder charts the progress of the test from an initial peak pressure, ending when a pressure drop of 2 lb. or more is observed during 2 consecutive ¼ hr. periods. In some cases other end points may be used.

According to Eastman, the test is somewhat more accurate than the "active oxygen" method and very much more accurate than the "Schaal oven" method for judging fat stability. The method has a constant error, whereas the other methods vary directly with the stability of the fat.

The test is claimed to be very much faster than the others and no special skill is required for the technician running it.—*Food Processing*, 1957, **9**, 98.

PALM OIL

Occurrence of Fatty Acids

The acidification of the fatty substances in the pulp of the palm fruit prior to processing is due to two different mechanisms: the liberation of a very active lipase due to the damage to the pericarp, and the indirect intervention of the micro-organisms developing on the fruit. Under perfect conditions of treatment, the second cause can be entirely avoided while the effect of the first can be reduced. If the conditions are neglected, the whole crop may acquire a high content of fatty acids. During the actual processing, the only method which may result in further acidification is spontaneous autocatalytic hydrolysis, but even this risk can be minimised by ensuring that the oil is not exposed to high temperatures for an excessively long period. The greatest risk of acidification, however, is due to enzymatic hydrolysis after processing, sometimes accompanied by autocatalytic hydrolysis. The best precaution is to reduce the water content of the oil to concentrations of about 0·05%.—A. Desassis, *Oléagineux*, 1957, **12**, 525.

PRUNES

Spoilage-Control in High Moisture Fruit

Trials have been carried out in the C.S.I.R.O. Laboratories at Homebush, Australia, on the preservation of high moisture prunes which could be eaten without rehydration. Prunes were immersed in boiling water for 8-12 min. to raise their moisture content to 29 and 33%, then cooled and packed in 12 oz. lots.

A fungicide, propylene oxide, was either placed in the bag, the bag then being quickly sealed, or the bags were sealed and placed in an air-tight chamber in which the fungicide was volatilised.

Direct comparison showed that the mould growth was more difficult to control at the higher moisture content, and 30% moisture came to be regarded as the ideal moisture content.

Four types of heat-sealed packages made from M.S.A.T. 300 *Cellophane*, *Saran*-coated *Cellophane*, polythene and *Pliofilm* were used in the tests. *Cellophane* bags were found to be liable to split if handled too much. A large variation in the evaporation rate from the different bags was noted, and, in one of the trials, some of the containers were infested by insects, indicating a need for a master container.

It was shown that a concentration of 0·1 ml. of propylene oxide per l. of free space was the minimum required to give satisfactory preservation in all cases. The smell of the fungicide had completely disappeared after 2 days, and most of the fungicide had completely hydrolysed, although some had escaped in the gas phase. Tests showed that 85-90% of the propylene oxide had been converted to propylene glycol, which was not considered a serious health hazard, since one would have to consume an astromonical amount of prunes before taking a lethal dose.—D. McBean and A. A. Johnson, *Food Preservation Quarterly*, 17, **3**, 48.

PIGS

Ultrasonic Methods for Predicting Quality

For the purpose of meat improvement and meat classification, methods permitting a more accurate assessment of the slaughter value of live animals are assuming greater importance. The Institute for Cattle Breeding and Dairying of Göttingen University has investigated a new method where the slaughter value of live pigs is assessed by means of ultrasonics. A supersonic impulse device, manufactured by Siemens and working with a frequency of 2·5 million cycles per second, is applied to the animal (dead or alive) in such a way that the echo permits an accurate measurement of the thickness of the bacon layer. In addition, it has been found possible, by measuring the speed and absorption of the ultrasonic waves, to make reliable predictions regarding the grade of the meat and the rate of fattening.—A. Claus, *Die Fleischwirtschaft*, 1957, **9**, 552.

BEEF

Tenderisation by High Temperature Ageing

Experiments have been conducted at the American Meat Institute Foundation to determine the best conditions for the rapid tenderisation of lower beef grades. The temperatures used in the study were 35°F., as a control, 60°F.; 90°F., and 110°F. Microbial growth in the meat at the temperatures given was controlled by lowering of *p*H, use of antibiotics, gamma irradiation, and ultra violet irradiation. Of these methods the use of antibiotics was found to be the most satisfactory.

The steaks held at 60°F. for 5 days were found to be significantly more tender than those held at 35°F. At 7 days there was a greater increase in the difference, and it was concluded that the ageing time for "utility" grade steaks at 60°F. was more than 5 days.

At 90°F., meat subjected to a 1 day holding time showed no significant difference in tenderness from the control. Control of microbial growth was too unreliable for a result to be obtained beyond that time.

The most significant result was achieved at 110°F. Steaks held at this level were significantly more tender than the control and it was found that no further tenderisation occurred after 48 hrs. of ageing.—Paul D. Brown, *American Meat Institute Foundation, Circular* No. 35, 1957.

SMOKED MEAT

Comparison of Smoke Production Methods

Frankfurters smoked with friction-generated smoke have been compared with others prepared with sawdust smoke at the American Meat Institute Foundation.

In the first experiment use was made of friction-generated smokes passed through filters which were being sprayed with water at 3 gal./min. and 1½ gal./min., and sawdust-generated smoke. The friction-generated smokes gave a somewhat milder flavour when the full spray was used than when the amount of water was reduced.

In a second experiment the friction-generated smoke was passed through 1 in. and ½ in. filters, and the latter continuously and intermittently sprayed with water at a rate of 1½ gal./min. A comparison was made with sawdust-generated smoke.

It was found that the friction-generated smoke contributed less charcoal flavour to the frankfurters than was the case with the sawdust-generated smoke. Intermittently sprayed smoke gave a less acrid, sweeter flavour than sawdust smoke. A creosote or phenol type flavour was apparent more often in the continuously sprayed smoke. Full use of the water spray gave a product closer to the sawdust-smoked frankfurter than did the intermittent use of the spray.—C. Edith Weir, *American Meat Institute Foundation, Circular* No. 35, 1957.

MEAT PRODUCTS

Microbial Counts of Solid and Liquid Spices

All solid spices used for meat products contain a greater or smaller quantity of different bacteria and moulds. The bacteria most frequently encountered belong to the bacillus type which are thought to cause spoilage of meat products. Aerobic and anaerobic spore-bearing rods are less frequent. However, in spite of the great number of bacteria contained in the spices, it has seldom been possible to prove that the spices were the immediate cause of meat spoilage. Spoilage has usually been caused by a technical hitch in the production process, and accentuated by unfavourable storage conditions. When this happens, the bacteria introduced into the meat product by the spices must be regarded as a contributory cause of spoilage. This risk can be reduced by using spice oils, which are fairly free from germs while possessing an extremely high seasoning value. In this way it is possible to avoid the difficult and often uneconomic process of sterilising the spices.—M. S. Pohja, *Die Fleischwirtschaft*, 1957, **9**, 547.

WHEAT

X-Ray Studies of Proteins

Wheat flour owes its pre-eminence for bread-making to the protein gluten which endows a degree of elasticity not found in other cereal doughs. Gluten is a complex mixture of hydrated proteins containing small amounts of lipids and starches. It has been separated into crude fractions, gliadin and glutenin, respectively soluble and insoluble in 70% aqueous ethanol, but none of its protein components has yet been crystallised. X-ray studies were limited to amorphous, heterogeneous specimens and these present studies extended earlier X-ray studies with particular reference to the bound lipids of flour.

Sections of the endosperm of wheat, rye, maize, groats, rice and barley were photographed on a low-angle focussing camera.

A relationship with the keratin-myosin group of proteins suggested that the protein fibres of this type were mainly responsible for the elasticity of the wheat gluten complex. A low-angle X-ray pattern, which distinguished the wheat from other cereals and varied greatly with the physical condition of the protein complex, was associated with the bound fat, and in particular with the phospholipids. The orientation of the 47A. spacing in gliadin and in the phospholipid fractions suggested that the protein fibres were held together by layers of the phospholipid, with the fat molecules roughly perpendicular to the protein fibres. In the light of other studies of phospholipids and the preponderance of C_{18} fatty acids among flour lipids, these phospholipid layers are probably in the form of bimolecular layers.

The bound fat constituted only 5% of the gluten but it has been found in much higher concentrations in some glutenin fractions, and in the type of structure postulated it might be expected to have a considerable influence on the cohesive and water-absorbing properties of the whole gluten complex.—W. Traub, J. B. Hutchinson and G. H. Daniels, *Nature*, **179**, 769.

Machinery and Equipment

NEW MACHINES FOR THE MEAT TRADE

Four machines were shown for the first time in this country by Foodtech, Ltd., at the National Federation of Meat Traders' Association's Exhibition held at Brighton on October 14 and 15.

The *Hakona* universal cutting, slicing and de-rinding machine utilises bacon rinds, singed rinds, bellies and back fat even from bacon pigs, and will slice back fat in long, thin, even slices from $\frac{1}{16}$ in. up to an inch. The width of these slices, which can be used as shapes to fill out meat loaves, pates, etc., can be up to $11\frac{1}{2}$ in. The machine can also be used for slicing beef, *e.g.* a whole breast of beef can be sliced evenly from $\frac{1}{8}$ in. up to an inch thickness.

The *Rollfix* machine is designed for use by butchers, and will roll all joints with fat in a few seconds, guaranteeing absolutely even rolling. It can be operated by unskilled labour and will roll any cut up to 30 lb.

The *Rohwer A.1.* sausage linker and filler is fitted with two nozzles, one for straight fillings and another for linking with special sheep casings, hog casings and for making skinless sausages, luncheon sausages, saveloys, polony, etc. Individual luncheon sausages can be portioned and twisted ready for cooking with this machine. The machine operates at all speeds from 80 to 140 per min., and can be easily washed in about 5 min. without the use of tools by using one bucket of lukewarm water.

It is claimed that the machine avoids compression and squeezing of the sausage meat by functioning only so long as a foot pedal is depressed. It has a capacity of 65 lb., believed to be the most efficient size for sausage manufacture, and effects an estimated saving of at least 18% in casing costs. The machine will fill out 15 lb. of pork sausage in hog casings at 8 to a pound, full size and in guaranteed weights, in 1 min. It offers a choice of 1, 2, 3, or more twist actions in the linking operation.

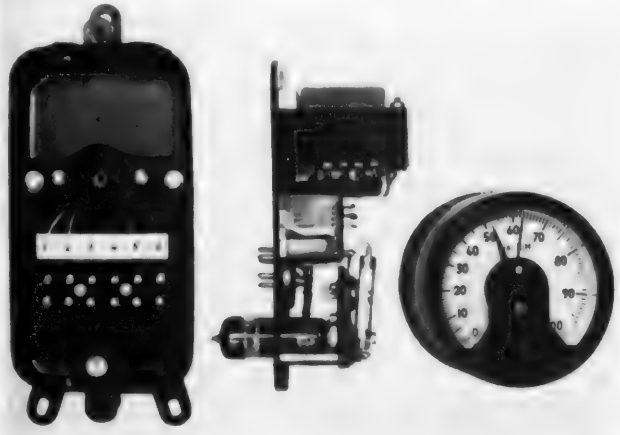
The *KS* sausage maker, which is a development from Foodtech's range of *Super grinders*, permits the automatic production of skinless sausages, frankfurters, and all kinds of luncheon and liver sausages. The extreme fineness to which the meat is chopped is said to increase its water-holding capacities. All kinds of frozen meat can be mixed, chopped and emulsified in a few seconds and, if necessary, sausage meat can be homogenised.

With the above machines detailed recipes will be supplied by Foodtech.

ELECTRONIC HUMIDITY CONTROL

A humidity control instrument incorporating an electronic relay is now being marketed by Alexander and Tatham, Ltd. Known as the *Regeltron* humidistat, this instrument is of the visual control type and is produced in a range of mountings to suit different applications. The humidity element is of the hygroscopic type, the operative member being a synthetic hair capable of giving readings over a range of 10% to 100% R.H. with an error of less than 1% R.H. The synthetic hair is said to react more quickly to changes in conditions than human hair, and to work better at temperatures up to 220°F.

The relay is supplied in a single or multi-circuit unit to make or break on rise in humidity, and operates on 110v. or 200/250v., 40/50 cycles supply.



The Regeltron humidistat which makes use of synthetic hair.

The *KS* sausage making machine, a development of the Foodtech "Super Grinder."

ELECTRONIC BATCH COUNTERS

An interesting new installation for the accurate counting and packing of bottle and jar caps has recently been made at the Poole Factory of the Wallis Tin Stamping Co., Ltd. Caps, which may be of any size or shape, coming from the cap-forming machines are fed on to a long and wide conveyor belt, along one side of which are situated a bank of standard *B.C.4 Electronic Photocell Decade Batch Counters*, made by the Electronic Machine Co., Ltd.

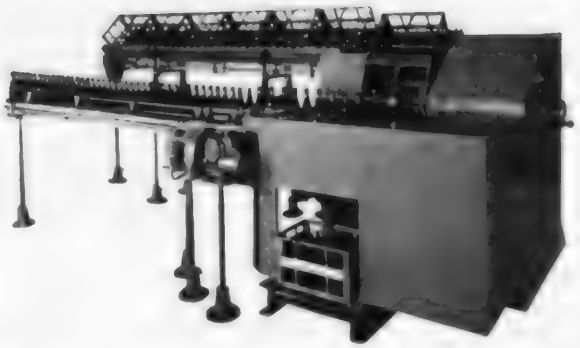
Guide rails on the conveyor belt divert streams of caps to each of the batch counters which simultaneously deal with the whole output. The caps are passed through a light beam in the photocell and light heads, and are then allowed to pass down the output chute into the waiting fibreboard container. In passing through the photo cell and light heads a light beam is broken, thus causing the count to be registered.

There are two alternative forms of final output situated after the photocell and light head units, both of which can be seen in the illustration. In the one on the left, the caps fall into the hopper and on through a trap into the waiting container below. On completion of a batch of pre-determined size a shutter closes over the trap whilst the

filled container is removed and replaced by an empty one. After a pre-determined time interval has elapsed the shutter opens and allows the accumulated caps, which have continued to pour into a hopper during this period, to drop into the new container; thus the cycle is recommenced without breaking the flow. The second alternative method, shown on the right of the illustration, consists of two output chutes with a gating mechanism.

The caps after passing through the light beam are diverted down one of the output chutes and thence into the waiting container. On completion of the batch the gating mechanism then diverts the flow of caps into the other output chute, which fills the second container.

These electronic photocell batch counters work on this application at the rate of 125 per minute, but they are capable of working at considerably higher speeds if required. In addition to the action of counting a pre-set batch quantity there is also a visual record of the total number of batches.



Automatic bottle crating machine made by Matthew Wylie and Co. Ltd.

FULLY AUTOMATIC BOTTLE CRATING

A completely automatic bottle crating machine, designed and built to suit single line installations by Matthew Wylie and Co., Ltd., and called the *Autocrate*, was on view for the first time at the Brewers' Exhibition.

The *Autocrate* handles ½ pint bottles up to 2¾ in. in diameter and 9¼ in. high at an output of up to 1,000 dozen per hour. It can be built to take practically any wood or metal crate with or without divisions and a "no crate—no bottles" control is incorporated. Feed is quite positive and freedom from label damage is said to be a feature of the machine.

Bottles are fed by single line conveyor to a spacer which arranges them to correspond with the crate pockets, four strokes of the machine filling a 24 pocket crate. Crates are fed either from behind or from the left hand side to a conveyor with a trigger mechanism that controls entry into the correct position for deposition of the bottles. The whole process, once begun, is purely automatic—no operator is required.

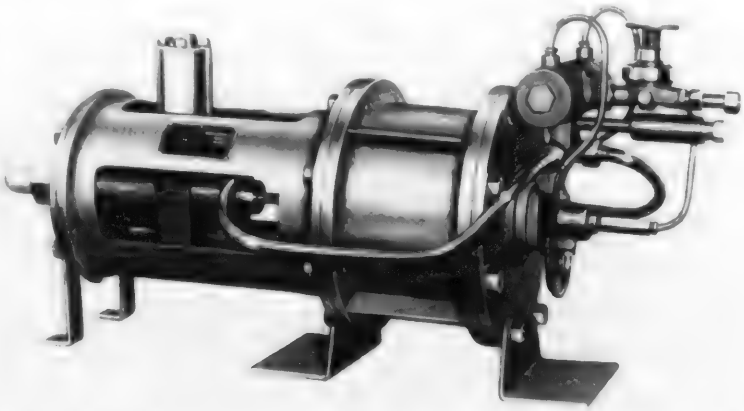
The *Autocrate* measures approximately 60 in. long by 78 in. broad by 63 in. high.

Bottle labelling and crating units can be built up by combining the Autocrate with the Ermold automatic multiple bottle labelling machine, also produced by Matthew Wylie and Co., Ltd. Outputs of up to 1,000 dozen labelled and crated bottles per hour can be achieved by combining one Ermold and one Autocrate—both machines being controlled by one operator only. The 800 doz. autocrate is available now, and the 1,000 doz. model will be available in April, 1958.

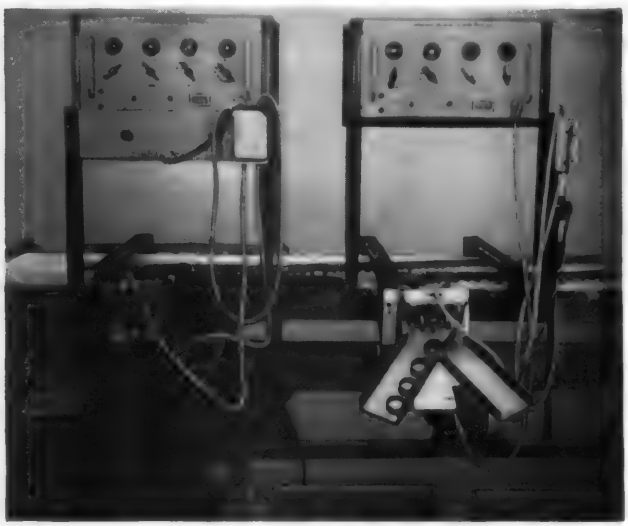
HYDRAULIC PUMP

The latest version of the *Airhydropump*, made by Charles S. Madan and Co., Ltd., is stated to be capable of achieving the high figure of 55,000 lb. p.s.i. In addition, the makers say that they have developed a range of hydraulic control valves, pressure release valves, and non-return valves, together with a series of pipeline couplings, T-pieces and other fittings for use with the machine which may be powered by a normal shop air line of up to 100 p.s.i.

The pump is said to be suitable for all forms of hydrostatic testing between 25,000 and 50,000 p.s.i. and for numerous manufacturing processes. The size of the pump, which is portable and fully automatic in operation, is 12½ in. by 44 in. and it stands 18 in. high.



The 55,000 lb. p.s.i. Airhydropump made by Charles S. Madan and Co. Ltd.



Electronic batch counters made by the Electronic Machine Co. Two alternative discharge mechanisms are shown.

News Digest

Bakers Exhorted to Support Research

At the annual general meeting of the British Baking Industries Research Association, held in London on October 30, several appeals were made to bakers, particularly those who are not already members of the Association, to increase their interest and support. The chairman, Dr. R. T. Colgate, who was re-elected to office for a further year, laid particular emphasis in his address on the value of scientific research, both to the human race in general and to the baking industry in particular. After quoting examples from the fields of pharmaceuticals, atomic energy and agriculture to emphasise the general value of research, Dr. Colgate enumerated some of the advantages which research work had conferred on the baking industry. He suggested, further, that the day had come when a training in the craft of baking would alone be insufficient to enable a man to meet the future demands of the industry; that there was now a demand for a new class of experts—bakery technologists and technicians. If the industry were to fulfil its full potential, a programme of education and expanding research would have to be encouraged.

Frozen batters.—In his last appearance at an annual meeting as Director of Research of the Association, Dr. J. B. M. Coppock underlined the chairman's remarks by pointing out the value of fundamental research, with its slow, but far-reaching, results, and by giving a striking specific example of one of the Association's recent discoveries. This was the development of deep-frozen cake batters packed in expendable foil casings, which could be baked off in the bakery as desired, or sold to the housewife to cook at home. Thus the baker could satisfy the demands of both the busy housewife with no time to cook for herself, and the less busy one who likes to do her own cooking, but might, none the less, welcome a chance to purchase her ingredients ready-mixed. Dr. Coppock illustrated his point with a display of highly appetising fruit and Madeira cakes which had been baked from mixes previously held for a fortnight at $-5°F$.

Dr. Coppock leaves the Research Association at the end of the year, to take up the appointment of Director of Research to Spillers, Ltd. While his loss will be felt severely by the Association, many bakers will join in congratulating him, and themselves, on the excellent start he has given to the organisation during its first 10 years of life.

Practical science.—To round off the theme of research in the baking industry, Dr. D. W. Kent-Jones gave an address on "Practical Science for the Practical Baker," in which he outlined some of the tests which scientists had devised that were of real use to the working baker. He spoke of the older "maltose test" and the newer Hagberg test for measuring the diastatic activity of flour, and demonstrated the simple apparatus with which the latter test is made. Dr. Kent-Jones then went on to describe two new tests evolved in the laboratories of Wallace and Tiernan, Ltd., the "specific recovery" and the "water tolerance" tests, which are used for evaluating biscuit doughs. These tests also require relatively simple apparatus and can be performed by any intelligent practical baker.

Thus each of the speakers sought to show, in his own way, the contributions which science has made to improving the art of baking and enabling it to compete more successfully under modern conditions. It is to be hoped that their words will reach the ears of those who were not, by virtue of their lack of support of the Association, privileged to be present to hear them in person.

Oatmeal millers' open day

The Scottish Oatmeal Millers' Association, the Oatmeal Millers' Association of England and Wales and the Northern Ireland Oatmeal Millers' Association held an open day recently at the Cereals Research Station in St. Albans.

The Research Committee of the three associations first held their quarterly meeting under the chairmanship of Mr. Philip Lea, after which the visitors were conducted round the laboratories by the director, Dr. T. Moran.

Demonstrations and discussions were arranged on several subjects, including the structure of cereal grains; rapid methods of determining the moisture content of cereals; composition and nutritive value of wheat protein; and analytical methods (fibre, fat, protein, etc,; filth test).

National production census

The census of production which will be carried out in 1958 by the Board of Trade will be the first detailed census since 1954. Changes which are being made should enable the census to be made more easily. Less information will be asked for than for 1954 and full particulars will be required only from firms employing 25 or more persons. The main purpose of the census is to provide information for a better statistical analysis of national income and expenditure.

Licensing and registration fees

Talks on plans for increasing many of the licensing and registration fees now paid by retailers and manufacturers are to take place between the local authority associations, a municipal correspondent reports.

Some of these fees, most of which were fixed many years ago, may be doubled or even trebled in some cases.

A spokesman for the Association of Municipal Corporations stated: "It is not yet known how fees will be increased, but there is certain to be a rise in many instances."

Licences issued in connection with the sale of game, ice cream and milk are among many to be reviewed.

Health hazard from stoppers

A special investigation into the possible risk of danger to health through the use of bottles with screw stoppers is being made by the public health and housing committee of the County Councils' Association.

This follows a complaint by a member council (Nottinghamshire County Council) that from the point of view of hygiene the internal screw-stopper is "very unsatisfactory."

The council stated that during the past quarter three cases of contaminated bottled drinks had come to their notice and the investigations showed that each of the bottles concerned was fitted with an internal screw-stopper. It seemed that people were in the habit of using bottles of this type as containers for petrol, paraffin, disenfectants and the like.

The council stated: "Whilst manufacturers are known to take considerable precautions to detect and destroy contaminated bottles and stoppers, occasionally the human element fails and contaminated stoppers pass unnoticed.

The ¾ ton Commer delivery van is available with a diesel engine, developing 54 b.h.p., or a 4-cylinder petrol engine developing 56 b.h.p. The bench-type front seat accommodates a driver and two passengers. Other features include a 4-speed synchromesh gear-box, safety steering, powerful hydraulic brakes, and hydraulic dampers at front and rear. A ¾ ton pick-up is also available.

Fish research demonstrated

Some of the work carried out by the Department of Scientific and Industrial Research was shown at the International Fisheries Exhibition at Lowestoft.

The main exhibits concerned the freezing of fish at sea and up-to-date kippering methods.

Iced white fish, quick frozen within three days of catching and cold stored at −20°F. can be treated like wet fish after it has been thawed. Herrings can be treated in the same manner providing that they are frozen within 24 hr. of catching.

Examples of "wet" fish fillets were shown and visitors were given samples of fried cod on the stand.

A model of a kiln claimed to produce uniformly well-cured kippers was on the same stand. The amount of smoke used in this type of kiln is controlled and it is said to be more simple to operate than the traditional kiln.

Dehydrated meal

An appetising two-course meal was recently cooked on an improvised cooker at the Middlesex County Council Emergency Feeding Training School. The meal which consisted of braised lamb steak with onions, and carrots, cabbage and potatoes, and apple crumble, was prepared from dehydrated foods from the Ministry of Agriculture, Fisheries and Food Experimental Factory at Aberdeen. It was stated that the steak, carrots and apples needed to be pre-cooked for only a short time before they were cooked in the ordinary way, while the other foods did not need pre-cooking.

It was agreed among the guests that it would have been difficult to tell that the meal was prepared from dehydrated ingredients.

Milk salesmanship

The Milk Marketing Board has appointed Mr. H. J. A. Speak of Warstock Lane, King's Heath, Birmingham, as its first instructor in salesmanship.

Mr. Speak entered the milk industry as a cycling ice-cream vendor and later began canvassing for milk sales. His job will be to teach roundsmen to sell more milk.

In reply to a question on how he would set about his job, he stated that the first thing to do was to instill ambition into milkmen. Milkmen should show keenness on the job and willingness to study the customer's requirements and not think of their job as a dead-end one.

New Dunlop cheese

The Scottish Milk Marketing Board has introduced a new style Dunlop cheese called *Torrylinn*. This is a rindless Dunlop, made white or coloured and with a steady moisture content throughout the 40 lb. cheese. This is rectangular in shape and wrapped in a tartan *Pukkafilm* wrapper, with the name featured. This cheese is being sold on the Scottish market by the Company of Scottish Cheesemakers and is made at Torrylinn Creamery in Arran, while the English brand will be *Mauchline* made at Mauchline Creamery.

The Board made history recently when it produced four Dunlop cheeses each weighing over half a ton. A. Mathews and Skailes, Ltd., ordered these monster cheeses for show at the London Dairy Show at Olympia.

Specially designed steel presses were used for these cheeses which were made from over 5,000 gal. milk. Each cheese weighed 1,300 lb. and measured 4 ft. in diameter and was 3 ft. deep.

New Regulations for pre-packed foods

The Board of Trade announce that they have made new Regulations* which come into effect on January 1, 1958, and which replace the Pre-Packed Food (Weights and Measures: Marking) Order, 1950, as amended.

The new Regulations maintain the basic principle of the Order of 1950 in requiring the wrappers or containers of all pre-packed foods, with certain exceptions, to be marked with a statement of the minimum quantity of the food contained therein expressed, either in terms of weight or measure, or, in certain cases, of number.

By comparison with the terms of the Order of 1950, the new Regulations show the following principal changes:

(a) Poultry has been added to the list of pre-packed articles which, subject to certain limitations on the weight of the wrapper or container, may be marked with the minimum gross weight.

(b) The exemption from the Regulations of food pre-packed by a retailer for sale on his premises is now limited to food pre-packed in certain specified weights only.

(c) The exemption from the Regulations of food sold in certain petty amounts no longer applies to the articles of food listed in the Third Schedule to the Regulations, all of which, except poultry, are subject to the petty amounts provisions of Section 8 and 13 of the Sale of Food (Weights and Measures) Act, 1926.

(d) The right to deliver pre-packed food unmarked, provided that an invoice or other document containing the requisite particulars is furnished to the buyer within 14 days, is now only available to a person selling to a wholesaler.

(e) The requirements with respect to the proper marking of wrappers and containers have been reduced and simplified.

(f) The Regulations do not now apply to fish cakes, meat puddings, sausage rolls, water ices, or to sausages which are not packed in metal, glass, or rigid plastic containers.

The safeguards to traders contained in sub-sections (1), (2) and (3) of Section 12 of the Sale of Food (Weights and Measures) Act, 1926, are applied to offences against these Regulations; and these safeguards, together with the defences contained in the Food and Drugs Act, 1955 (in Scotland, the Food and Drugs (Scotland) Act, 1956), substantially correspond to these contained in the Order of 1950.

* The Pre-Packed Food (Weights and Measures: Marking) Regulations, 1957 (SI 1957 No. 1880 H.M.S.O. Price 6d, by Post 8d).

OBITER DICTA

● It is not a point that we seek to stress in our advertising, but it is a fact that Guinness owes a great deal to chemical plant manufacturers.—*Sir Hugh Beaver.*

● A man from Persia arrived in London recently and telephoned an enquiry for a canning plant. When asked what he wished to can, he replied " sheep."—*Press Handout.*

● In this country the appearance of a plate of spring onions with the cheese course was for many years the signal for a cry of " lovely violets " from the professional humorist of the party.—*Traver's Circular.*

● William Stacey, 76, of Herne Bay, found and ate a tin of emergency rations — chocolate and bully beef—issued to him as Boer War rations at the siege of Ladysmith in 1896.—*Daily Telegraph.*

● It was pleasant to overhear (as I did during a heat-wave) a waiter's remark on reporting for duty that it was a pleasure to come to work and cool off!—*Managing director, Quaglino's, discussing the restaurant's air-conditioning unit.*

● " You may eat it if you wish," Lord Dunsany would mournfully observe, pointing at the commercial variety of table salt, " but I warn you that you will be consuming the bones of your ancestors."—*Daily Telegraph.*

● During Colonel Batchelor's speech a fleet of twenty 10 h.p. brand-new Ford and Morris travellers' cars drew up outside the Hotel Majestic. Each car was painted green and bore the registration letters PEA.—*Press Handout.*

● A 200-year-old Danish tune, discovered by Jack Jordan in the course of researches at the British Museum, has been combined with a modern advertising jingle in the latest commercial for Danish bacon. The tune is called Englesk Polka.—*Press Handout.*

● Presumably the product, a day's ration in a collapsible tube, will be of great value in disaster areas and may also be helpful to commuters who can uncap the tube and gulp a full day's rations as they dash for the train, but it will be of no help in the household where the problem is to teach the children good table manners.—*Aluminium News.*

NEW C.W.S. PRESERVES LABORATORY

A new central group laboratory is now in operation at the C.W.S. preserve works at Middleton, Manchester. In addition to routine checks, research into development and quality control will be carried out on behalf of the four factories in the group. Covering about 2,000 sq. ft., the building comprises the main analytical laboratory illustrated above, a smaller laboratory for research work, a store room, and a small office. The laboratory is furnished on the unit principle, with formica-topped benches and cupboards easily removable to give access to cold water, gas, and electricity services. The benches are lit with individually controlled strip lights, and the equipment includes three fire-proof fume cupboard units incorporating external control of water, gas, and electricity supplies. The C.W.S. architects' and building departments designed and built the laboratory.

Corrosion Convention proceedings

All 13 papers read at the Corrosion Convention held by the Leonard Hill Group in London on October 15 and 16 will be published, together with the ensuing discussions, as a book entitled *The Proceedings of the Corrosion Convention.* It is hoped that the book will be available early in 1958. It will cost one guinea—post free.

As it is anticipated that there will be a heavy demand for these proceedings, intending purchasers should immediately send their orders, together with a remittance for one guinea, to the publishers, CORROSION TECHNOLOGY, Leonard Hill House, Eden Street, London, N.W.1.

Dehydrated fish

Dehydrated fish made by Kestrel Products, Ltd., of Aberdeen, by a new process proved a major success at the recent Copenhagen International Fisheries Fair. It was part of a show put on by Aberdeen fishing interests which proved so successful that extended trade in frozen, smoked and cured fish is expected to result on an expanding scale.

Frozen lamb experiment

Frozen Shetland lamb is to be introduced this year for the first time as an alternative to imported New Zealand and Australian lamb. The Shetland producers have arranged with the Herring Industry Board to use the quick freezing section of their plant at Lerwick to take 600 carcases, each weighing 30 lb. This small experiment is regarded as the start to a larger experiment which could link up use of the freezing facilities for maximum returns in terms of both fish and meat.

New head office

The administrative side of every division of the firm will be accommodated in the new head offices of Honeywell-Brown at Greenford, Middlesex. The foundation stone of the building, which is expected to be opened in June, 1958, was recently laid by the managing director, Mr. E. C. Vorlander.

The building will also house a training school at which both employees and users of the firm's equipment will be taught how to apply instrumentation to industry.

PEOPLE

LORD COHEN OF BIRKENHEAD has been nominated president of the Royal Society of Health in place of LORD PERCY OF NEWCASTLE who has decided to retire for health reasons. Lord Cohen's election will take place at the Society's annual meeting in May, 1958.

*

MR. W. S. ALEXANDER has been reappointed chairman of Harvey's Belgravia Foods in place of Capt. W. M. H. Pollen, who has resigned from the board. MR. E. G. ALEXANDER has resumed his duties as managing director on the resignation of Mr. N. Allan-Smith from the board. Capt. Pollen joined the board and succeeded Mr. Alexander as chairman in December, 1956.

*

PROF. J. DE CLERCK, director of the Brewing School at the University of Louvain, Belgium, is now visiting several brewing centres in the United States. One of his first important visits was to the oldest brewing school in America, the United States Brewers' Academy, in Mount Vernon, New York, and to Schwarz Laboratories, Inc., also of Mount Vernon, who are now engaged in problems relating to gushing of beer, and other phases of brewing research.

*

MR. HEINRICH SCHWINGER, chief designer of Fr. Hesser Maschinenfabrik AG., Stuttgart—Bad Cannstatt, will celebrate his Jubilee in November of this year.

Mr. Schwinger was born in 1893 in Fellbach near Stuttgart, and commenced his career in 1907 as an apprentice with Hesser. He became chief designer in 1931 and since then under his auspices a number of new designs in the packaging machinery field have been developed which have been most favourably accepted both in Germany and abroad.

*

DR. R. T. COLGATE, F.C.G.I., F.R.I.C., is resigning at the end of this year from his position of chief chemist and chief technical works manager with Huntley and Palmer, Ltd. He has been with the firm since December, 1913, when he succeeded the late Dr. E. F. Armstrong, a past president of the Society of Chemical Industry, who was the first works chemist employed by the firm. Dr. Colgate was the Hon. Treasurer (1929-35) and the Hon. Secretary (1943-45), and in 1951 chairman of the Council of the Society.

DR. R. FALCONER, F.R.I.C., has been appointed to the post of chief chemist with Huntley and Palmer, Ltd., who are retaining the services of Dr. Colgate in the role of scientific consultant to the company.

Mr. Frank Frost, managing director of Kraft Foods, puffs mightily to extinguish 70 candles on a birthday cake. It is not his, however. The occasion was a lunch in London to launch the 70th birthday appeal for funds of the London Commercial Travellers Benevolent Society. Mr. Frost is president of the Association. The appeal target is £12,500. The cake was presented by Craigmillar and British Creameries.

MR. WM. THOMSON, managing director of Morton Machine Co., Ltd., of Wishaw, Scotland, has accepted the invitation of the Council of the Bakery Equipment Manufacturers' Society, Ltd., to fill the casual vacancy in its ranks caused by the retirement from the Council of MR. T. B. COLLINS of Thomas Collins and Co., Ltd.

Morton Machine Co., Ltd., were among the founder members of the Society when it was formed in 1934.

After 30 years' service, Mr. A. E. ILIFFE, director and general sales manager of the Benjamin Electric, Ltd., relinquished his post of general sales manager on October 3, but will continue actively with the company as director of sales. MR. J. O. K. PURDY has been appointed to the position of general sales manager, and has resigned his post as assistant manager (Lighting Sales Division), A.E.I. Lamp and Lighting Co., Ltd.

Erections and Extensions

The Nestle Co., Ltd., are planning to build a large factory at Dalston, Carlisle.

*

Vere and Sons, bakers, have plans in hand to build extensions to their bakery in Quarry Hill, Rotherham, Yorks.

*

Shipmans (Middlesbrough), Ltd., bakers, are planning to erect an extension to their bakery at Burlam Road, Middlesbrough, Yorkshire.

*

Dicky Bird, Ltd., ice cream manufacturers, have plans in hand to construct a cold store and warehouse at Alfred's Way, Barking, Essex.

*

Distillers Co., Ltd., have been granted permission to build a warehouse and office premises at the junction of Temple Way and Cheese Lane, Bristol.

*

A. G. Linfield, Ltd., have had plans approved to build an extension to their canning factory at Chessfield Nurseries, Thakeham, Chanctonbury, Sussex.

Armour and Co., Ltd., are having a meat warehouse erected at North Road, Middlesbrough, Yorks.

*

Chocolat Tobler, Ltd., chocolate manufacturers, are planning to extend their factory at Dundee, Scotland.

*

Severn Valley Meat Products, Ltd., have plans in hand to erect an additional floor to their factory at Grosvenor Place South, Cheltenham, Glos.

*

The Clyde Navigation Trust's extension to **Meadowside Granary** at Partick, Glasgow, approved in November, 1955, at a cost of £3 million is now under construction after site clearance. The new granary will have a capacity of 50,000 tons and double the existing Meadowside holding space. It will also allow faster turnround of grain ships to the Clyde. Contractors are Holt and Co., Ltd., of Edinburgh, and completion of the project with six quay wall pneumatic elevators handling 120 tons of grain an hour and four conveyor bands taking up to 400 tons an hour, is expected to be completed by October, 1959.

MR. JAMES TUCK, who joined Smedley's, Ltd., as a trainee in May, 1954, has been appointed assistant manager at the firm's Evesham factory. He began training with Smedley's at their Wisbech (Cambs.) works before moving to Evesham.

MR. E. J. MANN, N.D.D., formerly assistant director of the Commonwealth Bureau of Dairy Science and Technology, has been appointed director of the bureau. He succeeds Mr. A. W. Marsden, who left the bureau in July to take up his new appointment of organising secretary of the XV International Dairy Congress.

Mr. Mann has been employed in the bureau for over 10 years and has been its assistant director since October, 1950. During 1949 he spent 6 months in Norway, and was attached to the Royal Agricultural College. During his stay there he travelled widely throughout Scandinavia and acquainted himself with the dairy industry there. In 1953 and 1956 he attended the International Dairy Congresses in The Hague and Rome and visited many dairying centres throughout Europe.

Mr. Mann has published many articles in technical journals reviewing developments in dairying. He is an officer of the Society of Applied Bacteriology and a member of the Society of Dairy Technology.

MR. G. D. S. BLACK, chairman of T. Wall and Sons (Meat Products), Ltd., has joined the board of the parent company, T. Wall and Sons, Ltd., of which MR. G. A. STONESTREET, formerly managing director, has been nominated vice-chairman. Lord Trenchard, chairman of T. Wall and Sons (Handy Foods), Ltd., and Mr. Black will, in future, be jointly responsible for development and co-ordination of Wall's meat interests as joint members of a co-ordinating committee of which Lord Trenchard will be chairman. MR. H. G. PINNER, chief accountant of the Wall's group, has been appointed commercial officer of this committee.

DR. PHILIP RIDLEY has joined the boards of both the Meat Products and Handy Foods companies of Wall's as technical director.

Mr. H. McK. BUTCHER, production director of the meat-products company, has joined the board of T. Wall and Sons (Handy Foods), Ltd., together with MR. L. G. LELLIOTT, formerly general manager, Handy Foods.

DR. E. SWINDLEHURST, technical officer of the ice-cream company, has joined the board of that company as technical director.

Flexile Metal Co., Ltd., have moved their registered offices to their new factory at Bessemer Drive, Stevenage.

FORTHCOMING EVENTS

Royal Society of Arts

December 4. Vitamins and the Scientist. By Frank Wokes, B.SC., PH.D., F.R.I.C., Director of Research, Ovaltine Research Laboratories. Meeting at 2.30 p.m. Address: John Adam Street, Adelphi, London, W.C.2.

Institute of Refrigeration

December 5. The development of a quick-freezing plant for distant-water trawlers. By G. C. Eddie, B.SC., R. T. Hales and D. W. Higham. Meeting at 5.30 p.m. Address: Pepys House, 14, Rochester Row, Westminster, London, S.W.1.

Society of Chemical Industry

Food Group, Nutrition Panel

December 11. Some nutritional and allied problems confronting the food manufacturer—2. The use of antioxidants. By Dr. C. H. Lea and Mr. R. J. Ward. Meeting at 6.15 p.m. Address: 14, Belgrave Square, London, S.W.1.

Institution of Production Engineers, Eastern Region

December 13. A review of methods for heating and ventilating factories. By F. Carter. Meeting at 7.30 p.m. Address: Golden Lion Hotel, Cornhill, Ipswich.

National Poultry Show

The 12th National Poultry Show, at Olympia, London, December 4, 5, and 6, will be the biggest display ever staged by the poultry industry.

In addition to displays of live and dead poultry a number of demonstrations will be staged, on such subjects as broiler production, packaging, modern marketing, work study, ventilation, conversion of feed into eggs, etc.

Macaroni campaign

British Macaroni Industry, Ltd., the trade association which comprises most of the firms in this country making macaroni, spaghetti, vermicelli and noodles, plan to run a national campaign aimed at informing the public on the wide range of macaroni products available and on the many hundreds of different ways in which they can be served.

British macaroni products are made from 100% Durum wheat, a hard Canadian wheat which has a high food value and does not disintegrate in cooking.

The campaign will seek, by means of stories and articles in newspapers and magazines and by radio and television and cinema programmes, to stimulate interest in these foods and thereby increase demand.

Overseas Enquiries

Germany: Coffee

Herr Hartwig Stender, Hamburg 11, Sandtorkai 5, would like to get in touch with U.K. coffee traders with a view to representing them in Hamburg.

Herr Stender is considered to be a suitable connection for United Kingdom firms.

Exporters interested in this enquiry should write direct to the Hamburg enquirer, at the same time, notifying the British Consulate-General, 8A, Harvestehuder Weg, Hamburg, 13, that they have done so.

India: Boilers for sugar plant

Three co-operative sugar mills, each with a crushing capacity of 800 tons of sugar cane per day, are being set up in Madras State at Madurantakam, Ambur and Udamalpet. Orders for the supply of sugar plants have already been placed; one unit is coming from Czechoslovakia and the other two from West Germany.

It is understood, however, that each of these mills would need one or more boilers (not exceeding 3 units) with a total capacity of 64,000 lbs. per hr. Credit terms extending over a period of 5 or 7 years are desired, and delivery is required to be made within six months of the date of placing orders.

British firms who are in a position to supply standard types of boilers are requested to send their offers direct to C. S. Ramu, Esq., joint director of Industries and Commerce Dept. and ex-officio director of Co-operative Sugar Mills, Government of Madras, Chepauk, Madras—5.

Pakistan: Canning plant, vertical type boiler

K. K. and Co., Ltd., Nishtarabad, Peshawar City, would like to receive quotations for a pilot plant for the canning of fish, shrimps, prawns, etc. The sizes of tins to be used, range from 8 oz. to 1 lb.; the shape is to be cylindrical. Plant must be of a design which can be gradually expanded. They also require quotations for a vertical type boiler capable of producing 1,500 lbs. of steam per hr.

K. K. and Co., Ltd., are a private limited company. They conduct a canning business for preserved fruit and vegetable products, and are considered to be a suitable connection for U.K. firms.

Interested manufacturers should send quotations, which should be made on a C. & F. Karachi basis, direct to Mr. Saifullah Khan, the managing director of the Pakistan firm. They should, at the same time, notify the U. K. Trade Commissioner, National House, Bank Square, The Mall, P.O. Box No. 287, Lahore, that they have done so.

Food News Overseas

Persian sardine cannery

A sardine canning factory at Bandar Abbas in Persia will shortly commence operations. This enterprise, started before the war, and subsequently abandoned for lack of tin-plate, has been re-started and is due to produce initially 2 million cans a year.

Starch plant in Korea

A plant for the production of starch and other by-products has recently been completed and is already in operation on the outskirts of Seoul. The plant, which is owned by the Tongyang Food Industrial Co., is expected to produce 7,200 metric tons of edible starch, 4,500 tons of glucose, 240 tons of dextrose, 990 tons of gluten and fodder, and 216 tons of corn oil during the first year.

Peruvian malt factory

Work was started recently by the firm Malteria Lima S.A. on the construction of a malt factory near Nana, 15 miles outside Lima. It is scheduled for completion by October, 1958. The company is controlled by two leading breweries in the Lima area. The construction of the plant has been entrusted to the local branch of Christiani and Nielsen, a Danish firm, and the equipment is to be supplied from Germany.

Chocolate and confectionery experts meeting

At the invitation of German manufacturers the Technical Commissions of the International Association of Confectionery Manufacturers and the International Office of Cocoa and Chocolate met in Wiesbaden from October 21 to 26.

The chairman of the first named Commission, Mr. C. L. Hinton, Supervisor of Research to the British Food Manufacturing Industries Research Association, represented the Cocoa, Chocolate and Confectionery Alliance. He is also chairman of the section of the Technical Commission of the International Office dealing with the organoleptic assessment of cocoa and chocolate.

The B.F.M.I.R.A. was further represented by Mr. E. H. Steiner, who is chairman of the section on the measurement of viscosity in chocolate, a subject on which the Research Association has carried out much work lately.

Fish canning in Peru

Two important canning firms in Talara, Peru, have stated their intention of closing down their tunny fish businesses there and moving south to the ports of Chimbote and Huarmey to process anchovy instead. The reason given is the fall in quotations for tunny fish on the United States market.

World coffee organisation

Representatives of the fourteen Latin American coffee producers at an International American Economic Conference at Buenos Aires have agreed to set up a world coffee organisation. The proposed organisation has yet to be approved by the respective governments. It aims to encourage the consumption of coffee, and to pool marketing operations.

Use for waste bananas

A plant will start production in Durban next year which will manufacture and export dried bananas and pig food made from waste bananas. The capacity of the plant will be 1,000 55-lb. cases of dried fruit and 250 tons a month of stock-fattening food, using about 750 tons of bananas for this production. An executive of the company said that the dried bananas would be made from first-grade fruit, but there are thousands of tons of cracked, third-grade bananas and waste which can be turned into a pig and cattle fattening food for which there is an increasing demand overseas.

Animal food additive

A urea product, in the form of spherical beads, for use in prepared animal foods has been developed in the U.S. The smooth round pills are said to be small enough to assure uniform mixing and fine enough to avoid segregation occurring in the feed while it is in transit. The pills are stated to be free-flowing and non-caking, which makes for direct blending into feed formulations without additional grinding or processing.

After the urea is made by combining ammonia and carbon dioxide at high temperatures, it is spray dried. It is then coated with a conditioning agent to prevent caking or lumping.

Up to one-third of the protein equivalent in complete feed and protein supplements for beef and dairy cattle and sheep may be supplied by this means.

Sugar refinery contemplated

A committee has been appointed to investigate the possibility of building a refinery at Adana in Turkey, which would use both beet and sugarcane. This year's beet harvest is estimated at about 2,460,000 tons, which should give nearly 370,000 tons of sugar, *i.e.* about 100,000 tons more than last year.

Vitamin A production in India

Among a number of schemes for the production of vitamins which have received the approval of the Indian Government are two in which synthetic vitamin A will be produced from home-grown lemon-grass oil. An annual production of 10 m. mega-units of vitamin A, worth about Rs. 5 million, is proposed.

Milk cartons

Production of milk cartons has started at Spikkestad, near Oslo, Norway, where the firm of A/S Elopack is manufacturing them under licence from the "Pure-Pack" Division of the American Ex-Cell-O Corporation. The Norwegian firm have been granted the sole selling rights for the whole of Europe, except for Belgium and Denmark, as well as Egypt and certain parts of North Africa. One machine is in use, producing 40,000 cartons, and initially it is expected that all the production will be exported.

Ghana Cocoa Marketing Board 10 years old

The Ghana Cocoa Marketing Board is now ten years old and Barclays Bank D.C.O., in reviewing the board's achievements, states that since its establishment it has bought over 2,383,000 tons of cocoa for shipment to 35 different countries. Main buying countries were U.S.A. 707,000 tons, U.K. 618,000 tons, Germany 273,000 tons and Holland 228,000 tons. The peak season was 1948-49 when 278,000 tons were shipped.

An estimate of 1956-57 production is given as 925,000 tons as against 848,000 tons last year.

The International Cocoa Conference has stressed the need for adequate stocks of cocoa to avoid the violent fluctuations in world market supplies which were bad for both producer and manufacturer. Some progress is being made in combating the swollen shoot disease which is the main cause of uneven cocoa crops in Africa.

Packaging

Marzipan fruit pack

The first food line packed in *Bubblepak* is being distributed for the Christmas market. David London and Co. have changed to this visible form of packaging for their miniature marzipan fruits, each *Bubblepak* containing 12 of the fruits and retailing at 1s. 6d. The container is of cellulose acetate which is vacuum-formed into shape. The yellow and chocolate coloured base card incorporates a basket design.

The fruits were previously packed in cellulose film bags which have been discarded in favour of the *Bubblepaks*, which are said to be simple and speedy to fill and assemble, allowing easy arrangement of the fruit. The containers are distributed by Gordon and Gotch, Ltd.

Aluminium in packaging

Details of the many applications to which aluminium may be put are given by the Aluminium Development Association who outline the versatility and the wide scope of aluminium. Built-up containers are made from decorated sheet in a manner which is basically the same as that used to produce similar containers made from tinplate.

The use of shallow drawn aluminium cans has been exploited mainly in Scandinavia, where they are used for processed foods such as fish, vegetables and certain meat products, the inside of the cans being lacquered. The lacquering is carried out by roller application to the sheet or strip metal before the can is drawn to shape.

The deep-drawing process is often used for the mass-production of metal containers, and for aluminium the type of presses and the tooling are the same as for other metals. These containers are stated to be very suitable for use with liquids and powdered products such as dried milk.

About 60% of the collapsible tubes made in this country are made of aluminium and these, as well as many rigid containers, are produced by impact extrusion.

Foil of 99% purity is already well established as a packaging medium for a large number of products, the foil often being laminated with film or paper. Foil containers, seals and capsules and labels have been increasingly used over the past few years.

Porridge oats in Diothene

A new bulk pack is being used by Morning Foods, Ltd., for their "Mornflake" oats. It is made of Diothene, the Metal Box Co.'s brand of polythene film.

It became obvious that there was a large potential market among hotel and catering establishments, smaller hospitals, and institutions, for a pack of oats that was neither too small nor too large, and which would save the wholesale grocer the trouble of weighing out from sacks. Consequently Morning Foods, Ltd., have begun to market their oats in 7-lb. bags.

The pack had to be easy to fill, strong and light, and offer a good measure of protection against damp, as well as showing the brand name clearly.

Diothene was found to fulfil all these requirements. The design, produced by one of the Metal Box Co.'s art studios, is printed boldly in red, and shows the brand name to advantage against the light background of oats.

A 7 lb. bulk pack of Mornflake oats. The Diothene bag is made by the Metal Box Co.

"Give-away" low cost records

A low-cost gramophone record made from transparent cellulose acetate only 0·003 in. thick is now available in Great Britain, which can be attached by adhesive to the exterior surface of a carton and subsequently cut out and played by the consumer.

The quality of reproduction is understood to be high, and the record is sufficiently durable to resist serious mishandling or misuse without any great affect to its playing quality, so that no special protection is necessary. No special procedure is necessary in the handling or filling of cartons bearing these cellulose acetate squares, and production speeds need not be affected.

Rainbow records, as they are known, have already been attached to the walls of the *Wheaties* cereal cartons produced by the General Mills organisation, a U.S. firm, at a speed of about 5,000 cartons per hr. In Great Britain facilities have already been installed by the packaging firm of E. S. and A. Robinson, Ltd., for their attachment to most mass-produced carton sizes in current use.

Playing time can vary from 70 seconds at 78 r.p.m. on a 5 in. record to 140 seconds at 78 r.p.m. on a 7 in. disc. Long playing records can also be made at no extra cost. Installed by Everest Plastics, Ltd., the new process uses a press which can print the microgrooves at 400 lines to the inch on to moving webs.

Marzipan fruits for the Christmas market are being packed in Bubblepaks by David London, Ltd.

New Companies

Albrin Products, Ltd. (590394.) 27, Ely Place, London, E.C.1. Mnfrs. of and dlrs. in food, technical and industrial products, etc. £500. Dir.: B. R. Thomas. Sub.: P. Kalotai.

Andronor, Ltd. (588655.) 5, Guildhall Chambers, Basinghall Street, London, E.C.2. Growers, importers, exporters, canners of, and dlrs. in frozen and other foodstuffs. £100. Dirs.: P. Greenhill and Jean Beckinsale.

Coinsites, Ltd. (590098.) 18, Maddox Street, London, W.1. Mnfrs. of and dlrs. in automatic and coin-worked machines for the supply of food and drinks. £100. Dirs.: J. R. Norris and J. Bennett.

Craigmillar Blending Co., Ltd. (589885.) Sicilian House, Sicilian Avenue, London, W.C.1. Whisky fillers, blenders, etc. £100. Subs.: D. O. Blanks and G. E. Hay.

Dornay Products, Ltd. (588651.) Dundee Road, Trading Estate, Slough. Mnfrs. of and dlrs. in food, food products, etc. £100. Subs.: D. E. Pratt and E. L. Halliwell.

Drobny and Co., Ltd. (589520.) 99, Sherwood Street, Worksop, Notts. To take over the bus. of mnfrs. of continental and other foods carried on by Jaroslav Drobny, etc. £200. Dirs.: J. Drobny, V. Skacel and L. Uhlir.

Eastern Frozen Foods, Ltd. (588585.) The Quay, Wivenhoe, Essex. £5,000. Dirs.: S. C. Young, W. Cresswell and L.C.M. Worsp.

Fry's Colorific, Ltd. (590278.) 6, Holborn Viaduct, London, E.C.1. Preparers and marketers of a preservative for meat, etc. £5,000. Dirs.: B. A. Thompson and S. C. Morley.

R. C. Hargreaves (Confectionery), Ltd. (588547.) £2,000. Subs.: C. H. Mayoh, 64, Albert Road, West Heaton, Bolton, and P. H. S. Dawson.

W. J. Hart and Sons (London), Ltd. (590665.) Mnfrs. of and dlrs. in packaging, food processing and weighing machines, etc. £10,000. Dirs.: J. and Wilhelmina J. Hart.

Lincolnshire Pork Products, Ltd. (589896.) Bank Chambers, Mount Street, Nottingham. £1,000. Dirs.: J. C., G. W. and J. R. Bunting.

Southern Fruit Products (London), Ltd. (584610.) 214, Bishopsgate, London, E.C.2. £1,000. Dirs.: H., Ethel, June A. and M. L. Grant.

T. R. Walker (Kvarnmaskiner), Ltd. (584472.) Flour, provender and compound milling engineers. £5,000. Dirs.: T. R. and Thyra R. G. Walker. Subs.: D. Best, 15, Gladstone Road, Rawdon, Leeds, D. Chambers.

Wm. Wheatley and Son, Ltd. (585080.) Hawdonside Works, Sunderland Street, Houghton-le-Spring, Co. Durham. Mfrs. of and dlrs. in confectionery, etc. £4,000. Dirs.: Dr. C. Lipman, A. E. and Mrs. M. Wheatley.

Whitelocks, Ltd. (584787.) Wellington Street, Stockton-on-Tees. To take over business of a cheese factor, importer and exporter carried on at Stockton-on-Tees by Arthur W. Austin. £20,000. Dirs.: A. W. and Monica A. Austin.

These particulars of new companies recently registered have been extracted from the daily register of Jordan and Sons, Ltd., Company Registration Agents, 116, Chancery Lane, London, W.C.2.

Technical Press Review
December

Manufacturing Chemist.—Filtration; Review of Filtration Equipment; Vaccines and Antisera; Highly Active Dialkylolamides; Progress Reports; Fertilisers and Plant Nutrients, Therapeutics, Detergents and Detergency.

Atomics.—These Men Made History; 10 Years of Atomic Energy in U.S.A.; A Low Cost Reactor; Atomic Energy Activities in U.S.A.; Design and Manufacture of Fuel Elements; Big Guns of the Atomic World; Review of Some American Nucleonic Equipment.

World Crops.—Value of Legumes in Crop Associations in the Tropics; The Quality of Tea—1; The Problem of Tillage in Sugar-Cane; The Termite—2.

Automation Progress.—Review of Interkama; Gauge Controlled Grinders in Germany; Simplification and Standardisation; Continuous Car Engine Testing; Transfer Press Assembles; Welds Car Wheels; Analytical Approach; Automatic Control of Photographic Print Exposure; Modern Punched Card Equipment.

Corrosion Technology.—Corrosion Convention, 2nd Day, Report of the Discussion; Protecting Concrete Against Corrosion; Protection Achievement at Manvers Main Colliery; Rusting and its Cost to Farming; Corrosion Problems with Fuming Nitric Acid.

Petroleum.—Shale Oil; Coryton Laboratories; Two Catalytic Factories; Solvents from Petroleum.

Textiles in Industry.—Synthetic Fibres in Paper; "Dynel" for Filtration; Overlays for Glass Reinforced Plastics; Developments in Glass Fibre Applications; Polythene as an Air Filtering Fabric; Terylene—Developments in Machine Felts.

Fibres.—Progress in the Production of Fibre-Forming Polyamides; Finishing and Dyeing of "Dynel" Fabrics; Fabrics Containing Cotton-Type Terylene Polyester Fibre; Improved Fungicidal Cotton Fabric Coating; New Materials from the Cotton Plant.

Dairy Engineering.—Looking Back on Olympia—Impressions of the 71st Dairy Show: Mechanised Crating Cycle; Pumps for the Dairy Industry and Pumping Survey.

Chemical and Process Engineering.—Filming Amines in Heat Transfer; Chemical Plant Manufacturers Meet in London; Sodium Silicate Production.

Specimen copies are available by writing to The Publishers, Leonard Hill House, Eden Street, London, N.W.1.

Trade Marks

DAN-VIKING.—763,320. Canned meat, luncheon meat, and sausages, all made in Denmark. **Mogens Berg,** 19, Jaegersborgallé, Charlottenbund, near Copenhagen, Denmark.

HIGHLAND - GEM.—762,491. Butter, cheese, lard (for food), eggs, margarine, cooking fats, canned meats, fresh meat and bacon. **A. J. Mills and Co., Ltd.,** Colonial House, Tooley Street, London, S.E.1.

CHUKIE.—762,504. Meat; and fish, poultry and game, none being alive. **J. P. Wood and Sons,** London House, Market Street, Craven Arms, Shropshire.

MAY MIST.—762,563. Canned fruits and vegetables. **Woodbridge Canning Co., Ltd.,** Hamblin Gardens, Woodbridge, Suffolk.

SKIRL.—764,062. Edible lard and cooking fats. **R. and W. Davidson, Ltd.,** 68, Virginia Street, Glasgow, C.1.

CARVEL.—750,794. Ice creams, fruit ices and frozen custards. **Thomas Carvel,** Winding Road Farm, Chauncey, Westchester, New York State, U.S.A.

TEA-TIME.—762,134. Biscuits (other than biscuits for animals). **Frears, Ltd.,** Woodgate, Leicester.

SAMBO LIQUORICE BUBBLE GUM.—762,219. **Chix Confectionery Co., Ltd.,** 15D, Argyll Avenue, Trading Estate, Slough, Bucks.

M.P.P.—B750,941. Dried potato in powder form (for food). **M.P.P. (Products), Ltd.,** Carrow Works, Norwich.

SHORTEX.—760,169. Shortening compounds being edible fats, for sale in England, Wales, Northern Ireland and the Isle of Man. **Co-operative Wholesale Society, Ltd.,** 1, Balloon Street, Manchester.

RIVERTIDE.—761,252. Canned fruits and vegetables. **Woodbridge Canning Co., Ltd.,** Hamblin Gardens, Woodbridge, Suffolk.

SEVERN BRIDGE.—761,265. Fresh salmon (not live), smoked salmon and tinned salmon. **A. J. Phippen, Ltd.,** Whitson Street, St. James, Bristol, 1.

SILVER GRILL.—763,239. Whole sides of bacon. **Danish Bacon Co., Ltd.,** 9-13, Cowcross Street, London, E.C.1.

ENERTOL.—763,386. Wheat germ oil for food for human consumption. **Welder Publications, Ltd.,** 60, Greek Street, London, W.1.

JEEP.—B765,557. Non-medicated confectionery. **Kent Confectionery (Maidenhead), Ltd.,** 72, St. Marks Road, Maidenhead, Berks.

WATERFALL.—762,757. Cereal preparations for human consumption; semolina, pearl barley, sago, tapioca, rice, macaroni, oatmeal; and starch (for food). **Williams' Bros. Direct Supply Stores, Ltd.,** Holloway Road, London, N.7.

HONEY QUEEN.—763,470. Cocoa, chocolate, chocolates, and non-medicated confectionery. **Nestlé Co., Ltd.,** Hayes, Middlesex.

New patents are from the Journal of Patents and new trade marks are from the Trade Marks Journal. In each case permission to publish has been given by the Controller of Her Majesty's Stationery Office. Each of the publications is obtainable from the Patents Office, 25, Southampton Buildings, London, W.C.2.

Information and Advice

This Service is available to subscribers to FOOD MANUFACTURE. If a stamped addressed envelope is enclosed replies will be sent by post. Enquiries cannot be answered by telephone.

Fruit juices

B.8363. *Could you supply information on the stabilisation of cloud in fruit juices.* (Govt. Fruit Preservation Factory, India)

The cloud of citrus fruit juice may be stabilised by pasteurising the juices at temperatures up to 200°F. for periods up to 30 sec. A plate-type heat exchanger is the most suitable equipment for this purpose. The main effect of the heating process is to denature and inactivate the enzyme pectin esterase which is present in the juice. If not so inactivated, this enzyme hydrolyses the natural juice pectin, destroying the colloidal properties of the pectin, on which the maintenance of the juice cloud depends. The heating also has the effect of dissolving further amounts of pectin from the insoluble particles suspended in the juice, thus further improving the cloud suspension.

In juices in which the cloud has separated or is tending to do so, the cloud can be stabilised again by the addition of pectin, but the pectic enzymes must first be inactivated as described above, otherwise the added pectin will also rapidly be destroyed.

Several substances with colloidal properties similar to those of pectin, but resistant to the action of pectic enzymes, have been tried for the stabilisation of juice cloud. Of these, Manucol ester, produced by I.C.I., Ltd., has proved one of the most successful.

The pasteurisation process described also kills off all spoilage organisms which will grow at the acidity prevailing in citrus juices, and the juice can therefore be filled hot into cans or other containers, which will not then require further processing. These containers should be cooled immediately in water, otherwise the flavour of the juice will be spoiled. If the juice is not filled and cooled in this way, it should be cooled through a heat exchanger similar to the one used for heating it, the juice in this case being circulated against cold water.

Some juices, such as pineapple, do not contain sufficient natural pectin for the maintenance of cloud in the juice, and in this case supplementation with pectin or other substances is essential if a cloudy juice is desired. The amounts of such supplements necessary cannot be specified without knowledge of the individual circumstances, but the minimum amount which is satisfactory can be found by a few simple experiments.

Honey clarification

B.8358. *Please advise us on treating liquid honey to prevent it from crystallising at a later date and on treating granulated honey to make it clear.* (Isle of Ely, Camb.)

All honey should be stored in lacquered tins and bottled as required, according to R. O. B. Manley ("Honey Production in the British Isles"). To bottle clear honey the requisite number of tins should be stood in water and the honey gently heated until it is just melted. Care must be taken in doing this since excessive heat will discolour the honey. The honey may then be blended if desired. After this the honey is allowed to cool over about 12 hr. in order to let the air bubbles rise to the surface.

To prevent regranulation it is necessary to heat again, this time in the bottles under the airtight seal formed by the caps. A galvanised tank is suggested for this purpose. The honey should be heated to a temperature at which a bottle can just be held in the hand. The honey will then remain liquid for at least four to six months and possibly for a year.

The same process may be used to clarify honey which has granulated, with the qualification that the temperature to which the honey should be heated is somewhere in the region of 140°F. Even more care is necessary when heating granulated honey as the block melts from the outside inwards and is more liable to scorch, with resultant damage to the flavour and colour of the final product. The granulation of honey intended for sale as a clear product should be avoided if possible as the clarification process requires much time and fuel.

Information supplied

The Enquiry Service has dealt with requests for names of manufacturers and suppliers of plant machinery and materials, and also general information as follows:

B.8267. *Information on cooling custard in 50/60 gal. quantities.* (Liverpool)
B.8268. *Information on synthetic cream flavour.* (Ches.)
B.8269. *Information on the production of dry cake mixes.* (New Zealand)
B.8271. *Suppliers of new or secondhand dicing machines.* (Lincs.)
B.8272. *Machinery for grinding coconut to paste.* (Brazil)
B.8274. *Suppliers of molasses.* (Cardiff)
B.8275. *Recipes for orange, lemon, pineapple, marmalade.* (Surrey)
B.8276. *Information on the manufacture of custard powder and jelly crystals.* (Ceylon)
B.8279. *Suppliers of maize meal.* (Liverpool)
B.8280. *Information on coating fish and potato patties.* (Leeds)
B.8282. *Information on pickled onions and jelly marmalade.* (Australia)
B.8283. *Information on the preparation of baby foods.* (Lancs.)
B.8290. *Suppliers of "puffing guns."* (Ches.)
B.8292. *Recipe for "instant icing."* (Australia)
B.8297. *Suppliers of de-germed maize flour.* (London)
B.8303. *Information on processing and equipment for edible maize protein.* (Canada)
B.8304. *Process for the manufacture of dried apple rings.* (Eire)
B.8305. *Recipe for non-alcoholic wine.* (Wars.)
B.8306. *Information on interestification of lard.* (South Africa)
B.8311. *Suppliers of nisin.* (Glasgow)
B.8316. *Mixing machine for blending powdered and paste ingredients.* (Bristol)
B.8320. *Suppliers of concentrated lime juice.* (Norway)

Recent Patents

COMPLETE SPECIFICATIONS ACCEPTED

786,200. R. M. HEINRICH: Pure Kaffir beer yeast and process for producing same.
786,355. BRITISH CELLOFHANE, LTD.: Manufacture of artificial sausage casings.
786,381. J. C. MCLAUGHLIN: Moulds for making pastry rolls filled with meat, fruit, jam or other edible material.
783,984. UNILEVER, LTD.: Drying vegetables.
783,861 and 783,862. W. AND M. DUNCAN, LTD., and J. SAUNDERS: Manufacture of milk chocolate.
784,063. C. J. L. WARREN and J. W. MILROSS: Sweets with covered centres and their manufacture.
784,064. C. J. L. WARREN and J. W. MILROSS: Method and apparatus for depositing hot viscous confectionery syrup.
784,065. C. J. L. WARREN and J. W. MILROSS: Apparatus for manufacturing sweets.
784,050. COCA-COLA, GES.: Insulating bags for maintaining the temperature of foodstuffs.
784,118. D. POUPET: Process and apparatus for skinning slaughterhouse animals.
784,157. FORGROVE MACHINERY CO., LTD.: Batch forming apparatus for obtaining sugar or sugar confectionery in rope form.
784,164. R. PARKER: Pie-making machines.
784,640 and 784,871. BRITISH CELLOPHANE, LTD.: Production of artificial sausage casings.
784,817. BUTTNER WERKE AKT.-GES.: Process and apparatus for simultaneously drying and cooling white sugar coming from a centrifuge.
784,861. RUHRCHEMIE AKT.-GES.: Process and mobile apparatus for drying moist grain.
784,865. A. K. OZAI-DURRANI: Quick-cooking rice.
785,433. BAKER PERKINS, LTD.: Apparatus for making wafer sandwiches.
785,434. BAKER PERKINS, LTD.: Manufacture of biscuits.
785,435. BAKER PERKINS, LTD.: Sandwiching machine.
785,436. BAKER PERKINS, LTD.: Manufacture of biscuits.
785,480. E. GRIMARD: Machine for abrading cereal grains.
785,522. C. M. BERNHEIM: Preparation of cereal starch.

ABSTRACTS OF BRITISH PATENTS

Pear peeling machine

An automatic machine for peeling pears while they are being moved along a straight line path has a number of cutters mounted in consecutive order adjacent to the path of movement of the pear, each cutter extending at the same angle and at a sufficient distance to remove a portion of the skin.

An impaling tube mounted on a carriage is adapted to hold the pair in position to meet the cutters. This carriage rotates the pears angularly to meet the cutters as it moves the pear forward. A cup supports the pear at a predetermined point during the operation and is moved as the pear is rotated. The cutters are mounted on guide members which meet the pear surface when the pear is moved along its path ensuring uniform peeling from the stem to the butt end.—781,399. *Food Machinery and Chemical Corporation.*

Coffee machine

A machine for preparing coffee as a drink has a rotating drum supported in a fixed casing, the latter having, in the direction of drum rotation, an opening for the introduction of ground coffee, an outlet having a perforated diaphragm for the prepared coffee and a discharge opening for the used coffee grounds, these openings being angularly spaced on the casing. The drum has at least one radial cylinder which can be placed by successive rotation of the drum into communication with these openings. An apertured piston which has a perforated diaphragm at its outer end is slidably arranged in the cylinder.

Hot water and steam under pressure are supplied to the cylinder when it is in the drink-preparing position to advance the piston for compressing the coffee grounds in the cylinder and against the perforated diaphragm at the drink outlet opening. The hot water and steam pass through the piston and the coffee grounds, forming the drink.

Water and steam are next supplied to the cylinder when it is in the used grounds-discharge position, for advancing the piston to eject the used grounds from the cylinder.—780,996. *M. Egi and P. Fiorenzato.*

Fruit storage

The carbon dioxide content of the air in a fruit storage chamber is regulated by a method in which gas is drawn from the chamber and circulated in contact with an aqueous solution of triethanolamine. Contact is made at such a temperature that CO_2 is absorbed from the gas by the solution and the gas is then returned to the storage chamber. The solution is circulated through a reactivation tank containing a heater, which raises the temperature of the liquid to such an extent that the CO_2 in the solution is driven off, a heat exchanger removing the heat from the liquid before it is returned to the fruit storage chamber to recommence the cycle.—782,848. *J. and E. Hall, Ltd.*

Manufacture of condensed milk

A process for concentrating milk is outlined in this invention in which raw whole milk is heated until the butterfat is melted, the heated milk is then homogenised, sterilised by heating to a higher temperature, evaporated under reduced pressure and filled directly into aseptic containers.

An essential feature of the process is that the milk is first heated to a temperature of 120° to 180°F. to melt the globules of fat and render them to a state in which they may be easily ruptured.

This preheating permits effective homogenisation, the globules being broken up by the use of a high pressure homogeniser to produce a uniform fluid. This fluid is then sterilised at a temperature of between 250° and 300°F. by such means as flash heating.

The milk may then be partially cooled, though it is preferable to run the hot milk from the heater into the evaporator.

In the evaporator the milk is subjected to a vacuum, so that rapid concentration can be obtained at a relatively low temperature, somewhere in the region of 140°F.

Finally the concentrated milk is filled into previously sterilised containers, such as metal cans, and immediately sealed under aseptic conditions without requiring any processing after sealing.

It is claimed that by following the steps outlined, a concentration of 3 or 4 to 1 produces a viscosity no greater than the customary evaporated milk which has a concentration of slightly above 2 to 1.—775,148. *Continental Can Co., Inc.*

Rendering of animal fats

Animal fats in their natural state, which are to be rendered, are first cut or broken into pieces and then mechanically disintegrated in such a way that the fat cells are ruptured. The ground material is then placed in a closed heated vessel containing an agitator. Vacuum is drawn and the agitator started up, the vacuum being regulated so that the material does not boil. The purpose of the vacuum is to remove the air entrained by the disintegration process, subsequently allowing the protein to settle very rapidly and preventing oxidation from spoiling the fat flavour.

The liquid is allowed to remain in the vessel until it is completely liquefied, when the pressure is reduced by bleeding in an inert gas, further insuring against oxidation. Heating to coagulation temperature is then carried out, the vacuum having been reduced to avoid excessive loss of water. The heating and agitation are continued until the temperature reaches between 63°C. and 82°C., when the proteinous material coagulates and loses some of its slimy nature, making subsequent separation easier.

The latter may be carried out by any one of several methods, *e.g.*, by centrifuge.

It is claimed for this process that hydrolysis is practically eliminated, the free fatty acid content is kept to a minimum, and that a saleable protein residue and a better all-round product are obtained.—782,940. *Canada Packers, Ltd.*

Abstracted from the Official Journal of Patents and from published specifications. These publications are available from the Patents Office, 25, Southampton Buildings, London, W.C.2.

FOOD MANUFACTURE

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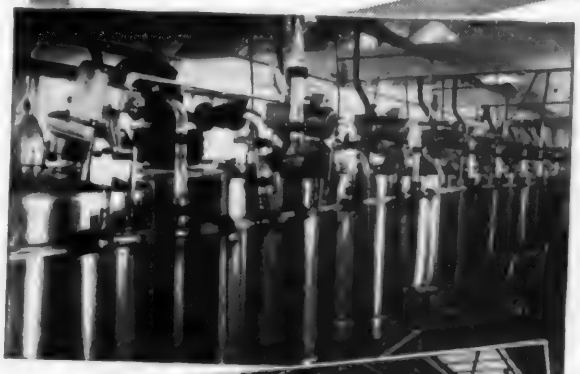

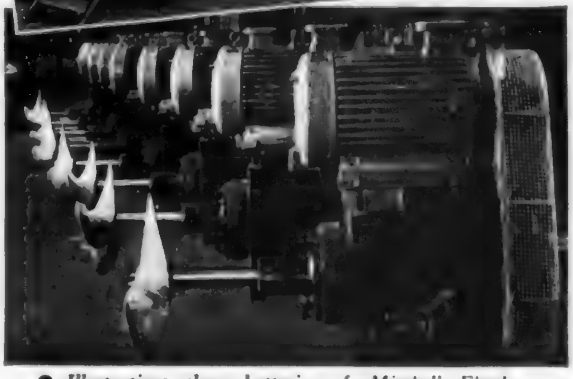

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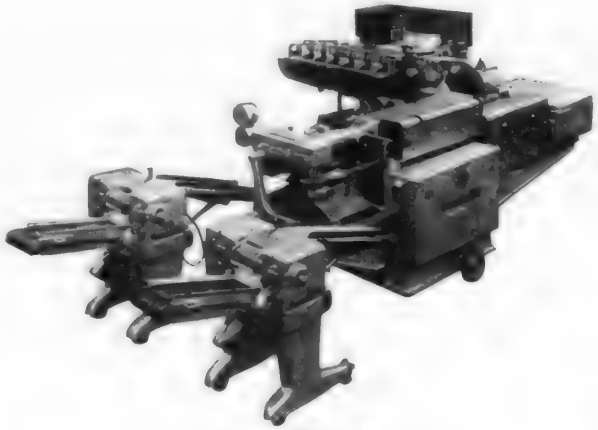

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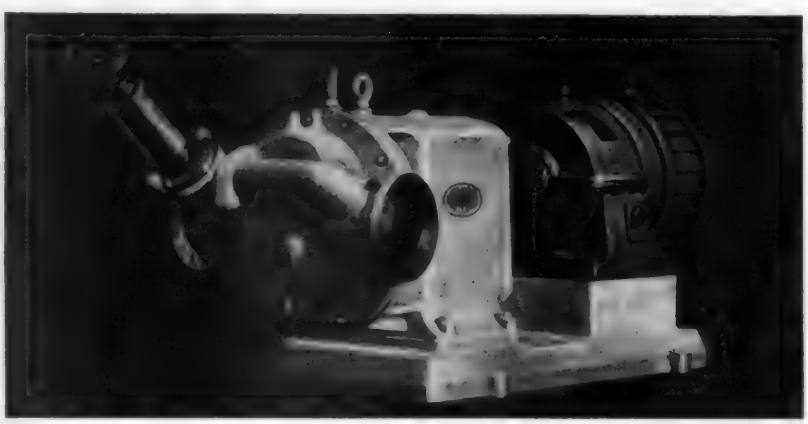

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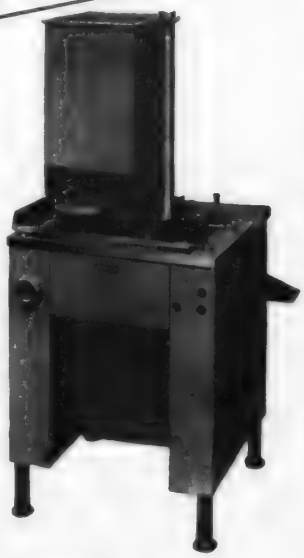

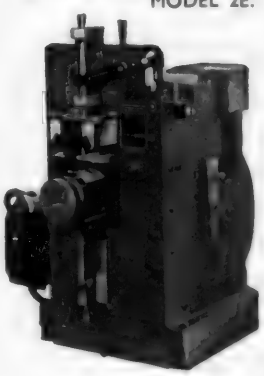

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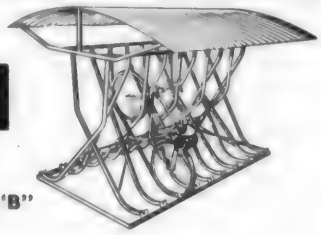

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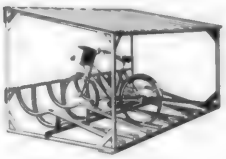

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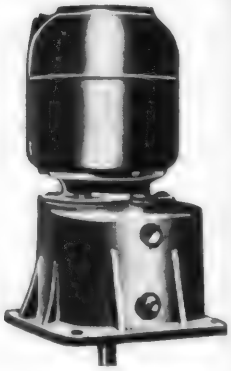

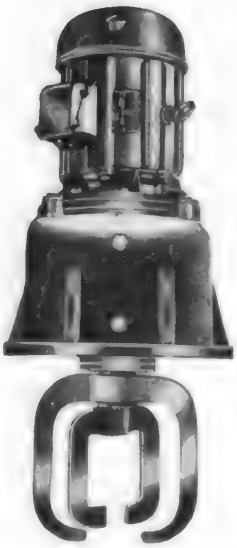

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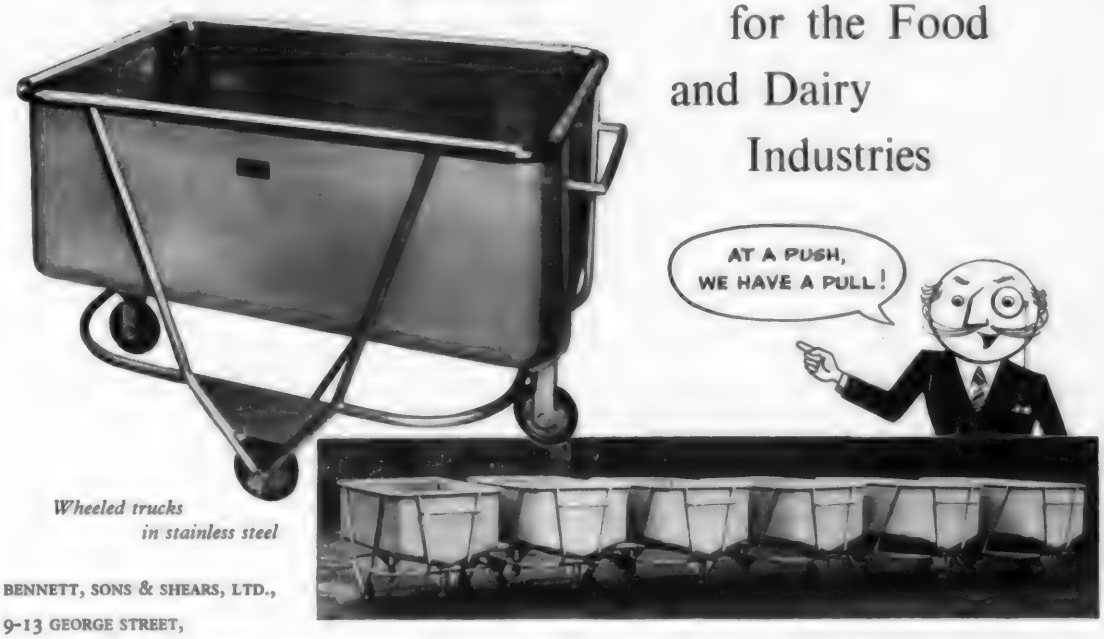

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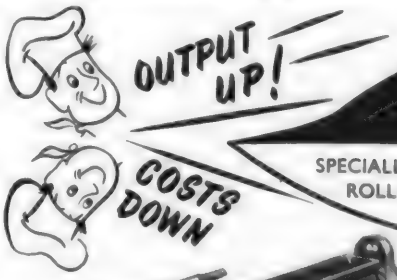

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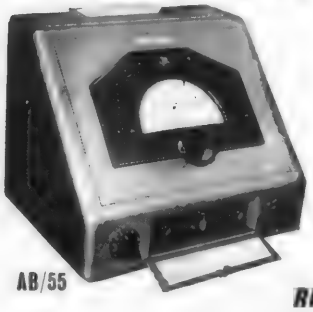

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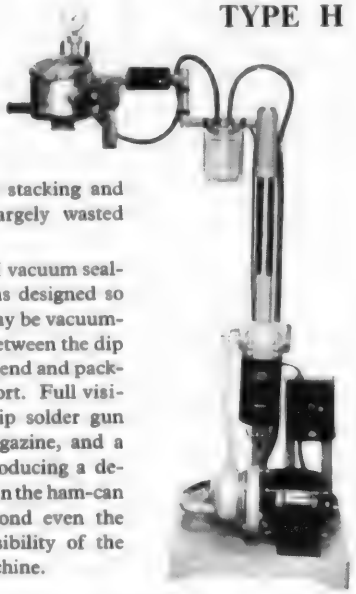

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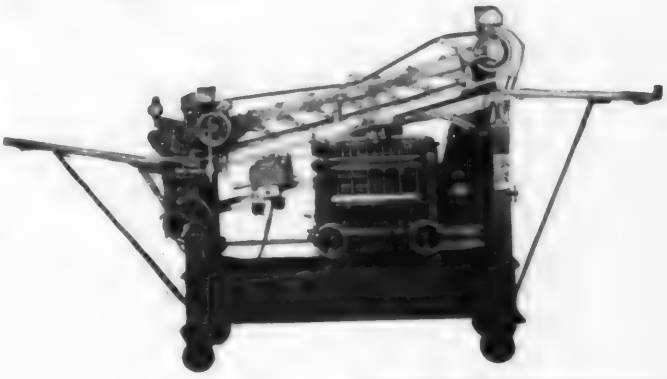

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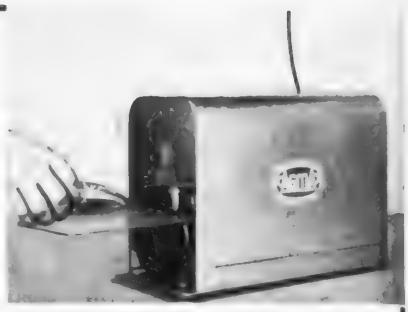

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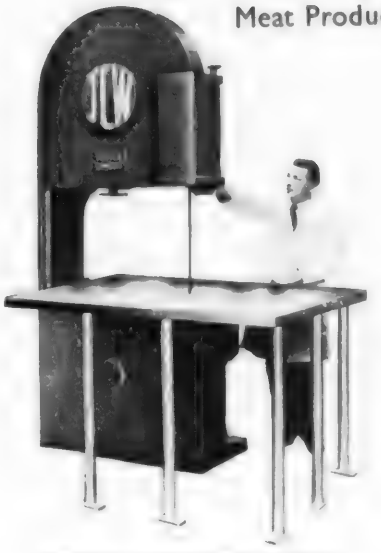

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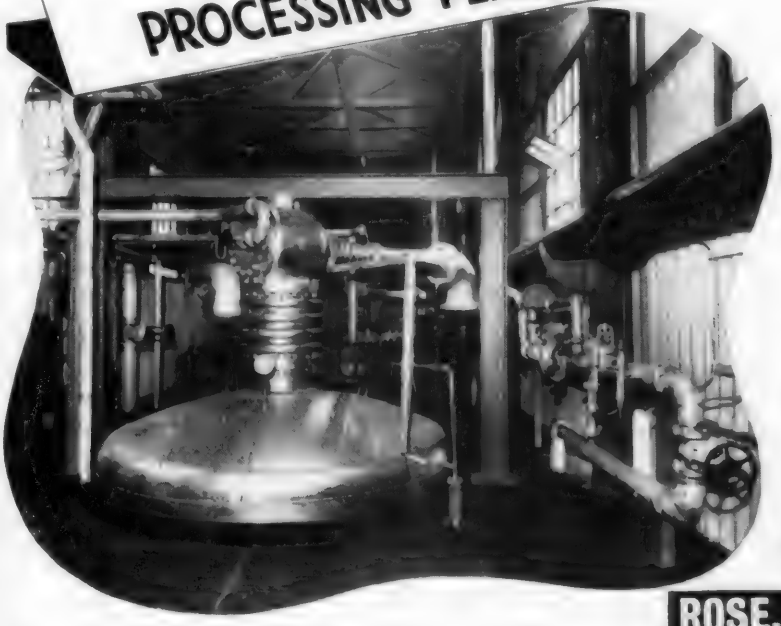

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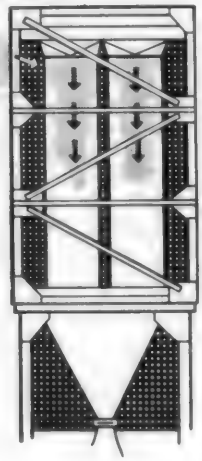

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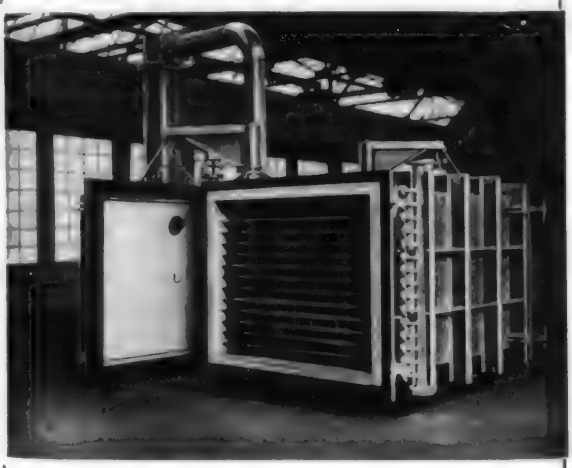

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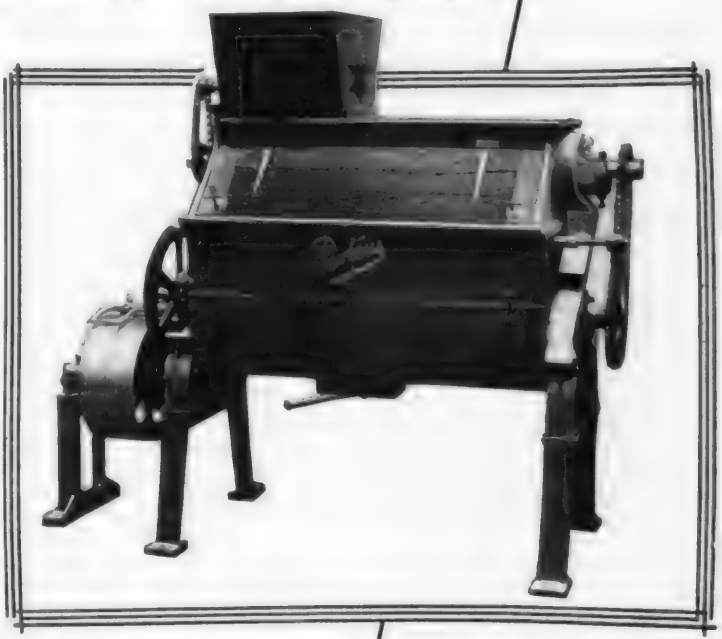

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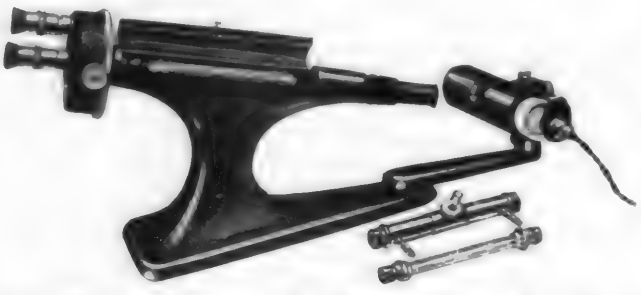

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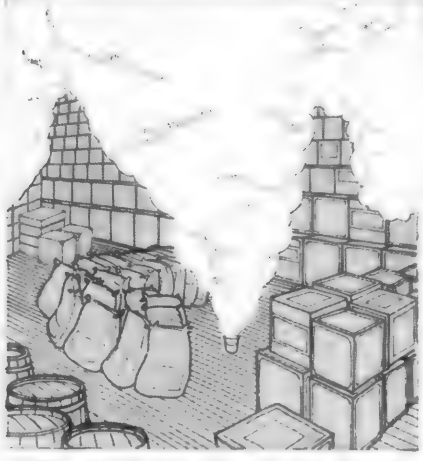

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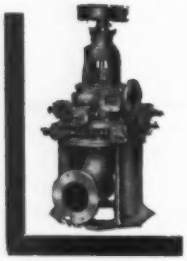

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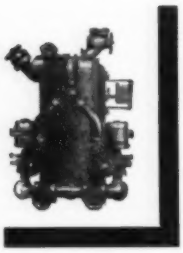

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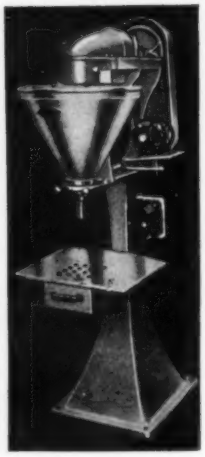

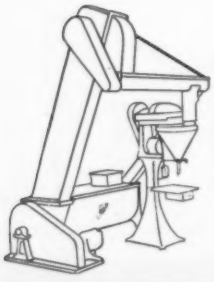

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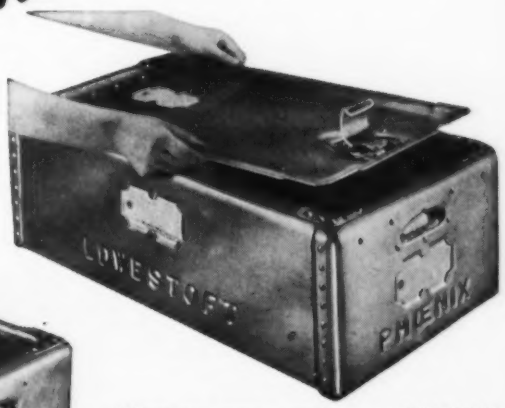

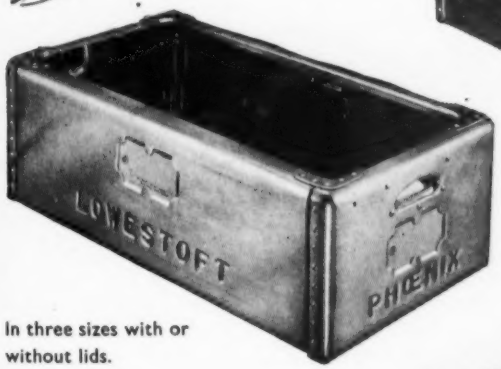

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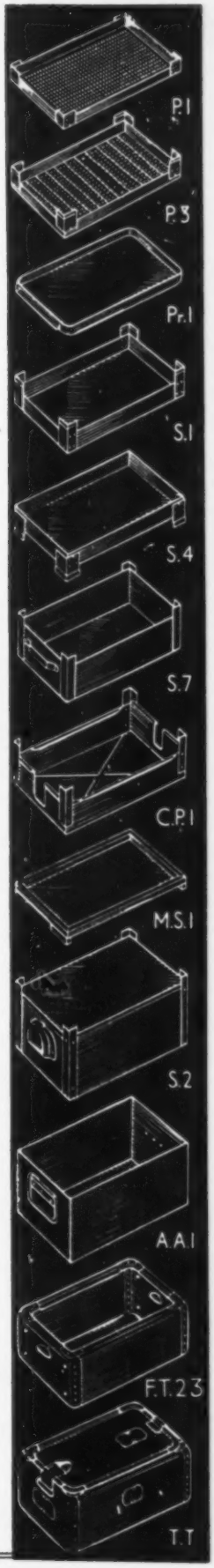

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